

The Fire Service Joint Labor Management Wellness-Fitness Initiative

THIRD EDITION





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3rd Edition



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FOREWORD



Harold A. Schaitberger
IAFF General President



Steven P. Westermann
IAFC President

The International Association of Fire Fighters and the International Association of Fire Chiefs have continued to work together in an unprecedented endeavor. We have gathered and maintained for over 12 years some of North America's finest fire departments to build a stronger fire service by strengthening our foundation — the fire fighter and EMS responder. Meeting the challenges of tomorrow's fire service requires that we keep our uniformed personnel fit and healthy today.

The ***Fire Service Joint Labor Management Wellness-Fitness Initiative*** has been an exciting challenge for everyone involved in this very positive endeavor. In this document and throughout the process of its development, enhancement and revision, we have addressed the needs of the total individual in a program designed to build and maintain fit and healthy uniformed personnel. Fitness — physical, mental, and emotional — requires an effective wellness program that is made available to recruits, incumbents, and retirees. Components of the Wellness-Fitness Initiative include medical evaluation, fitness, rehabilitation and injury prevention, behavioral health, and data collection.

It is no secret that, historically, the fire service has placed a great deal of its focus on maintaining apparatus and equipment rather than the uniformed personnel who provide emergency services and use such equipment. Fire fighters and EMS responders respond to emergency incidents that require extreme physical exertion and often result in adverse physiological and psychological outcomes. Over time, these adverse outcomes impact the overall wellness of the fire fighting and emergency response system. Often, past attempts to address personnel fitness have been piecemeal, such as recent trends to unilaterally implement timed, task-based performance tests. Such piecemeal approaches have failed to produce universally acceptable and productive results.

Fire chiefs and IAFF local union presidents participating in the Fire Service Joint Labor Management Wellness-Fitness Initiative have contributed to developing an overall wellness-fitness system with a holistic, positive, rehabilitating and educational focus. All participants have committed themselves to overcoming the historic fire service punitive approaches to physical fitness and wellness issues. They have committed to

moving beyond negative timed, task-based performance testing to progressive wellness improvement. Moreover, in a joint endeavor all labor and management representatives have committed themselves to the implementation of an individualized wellness-fitness program that is based on the recommendations located in this document.

The ultimate goal of the comprehensive ***Fire Service Joint Labor Management Wellness-Fitness Initiative*** is to improve the quality of life of all uniformed personnel. The project seeks to demonstrate the value of investing wellness resources for the duration of uniformed personnel's careers in order to maintain fit, healthy, and capable fire fighters and EMS responders. An effective program will minimize the expenditures on lost work time, workers compensation, and disability. In addition, through data collection and analysis, participating departments will create an invaluable database which can be utilized throughout the fire service.

This comprehensive project on physical fitness and wellness issues involved the creation and now 12 years later, the continuation of a network of geographically diverse fire departments with excellent union/management relations. Each of the fire departments selected was represented by the fire chief and the IAFF local union president, significant input from technical experts from each department was given. As participants, fire department and IAFF local union officials detailed their physical fitness programs and needs, such feedback help assist in creating and implementing a practical fire service program, which was committed to sharing new knowledge with the consortium. The IAFF has facilitated this effort and provided the necessary resources to complete this project. The IAFC, as an organization, participated in all phases of this WFI revision.

For the past twelve years, numerous task force meetings and technical committee meetings were held as part of this Initiative. The task force, consisting of the IAFF, the IAFC and the fire department chiefs and IAFF local union presidents, directed the content of the document. Each department was represented on the technical committee by exercise physiologists, fitness coordinators, department physicians, behavioral health professionals, and information management personnel. Expert advisors were utilized throughout the process to assist with meeting proceedings. Facilitating and coordinating the work of the task force and technical committees was completed by the IAFF Division of Health, Safety and Medicine.

The Fire Service Joint Labor Management Wellness-Fitness Initiative is now a complete medical, physical fitness and wellness program package. Since the initial distribution of this manual, the IAFF, the IAFC, the Task Force, and technical committee members have continued to address each of the Initiative's components. The third revision of this manual reflects our commitment to keep this project current and seek its full implementation in all career fire departments.

ACKNOWLEDGMENTS

The IAFF Department of Occupational Health and Safety would like to lend its appreciation and gratitude to those individuals who contributed their talent, knowledge and expertise towards the development and completion of the Fire Service Joint Labor Management Wellness-Fitness Initiative.

Foremost to the leadership of the IAFF and the IAFC for their joint commitment on behalf of labor and management in meeting the challenge to design and implement an unprecedented program to save fire fighters' and EMS responders' lives. The foresight of IAFF General President Harold Schaitberger and IAFC President Steven Westermann drove this historic labor/management effort to its success and created a future model to address mutually important labor and management issues. The organizational commitments allowed this project to be completed with unanimity in all issues before an extremely diverse group.

Special acknowledgment is given to the IAFF Division of Occupational Health, Safety and Medicine staff responsible for coordinating the Initiative process and manual for their persistence in completing the directed research as well as the manual writing and organization of the project, including Jim Brinkley, Director of Occupational Health and Safety, and IAFF Health and Safety Assistants Jason Atkins, Courtney Fulton, Ron McGraw, and Bart Siciliano. The Division's administrative staff, especially Lisa Aaron and Joyce Vanlandingham, was responsible for the preparation of all meeting materials and meeting aids and formatting of the final manual. In addition, IAFF Occupational Medicine Fellows from Johns Hopkins School of Hygiene and Public Health provided valuable assistance with the development and review of all medical related issues. We were also assisted by a number of fire department physicians, who served as technical representatives, and worked on this document, especially Dr. Don Stewart, Fairfax County Fire And Rescue, Dr. Paul Parrish, Austin Fire Department, Dr. Steve Moffatt, Indianapolis Fire Department, Dr. David Prezant, FDNY, and Dr. Jay Fleming, Phoenix Fire Department, Dr. Frank Pratt, Los Angeles County Fire Department and Dr. Tony Lynch, Calgary Fire Department. Assistance in editing and final document design and layout was done by the IAFF's Communications Department, Jane Blume Director and Kristin Davis, Production Assistant.

We gratefully recognize the IAFC officials and staff who participated in the project, including Mark Light, Executive Director and Vicki Lee, Project/Human Resources Manager.

We are indebted to the Fire Service Joint Labor Management Wellness-Fitness Initiative Task Force, including the IAFF, the IAFC, the ten fire departments and IAFF local unions and their technical, medical and operations staff for the commitment of time and resources, and for their thoughtful direction and insight to the final program's im-

plementation. Each department and IAFF local union, regardless of the numbers of personnel committed to the project participated equally in a balance with the IAFF and IAFC that assured the Initiative's success.

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Literally, hundreds of members of the above departments and locals participated over the past 12 years. However, we must recognize the efforts of members of our PFT Oversight Committee, who continually assisted in the revision process, especially Ian Crosby, IAFF Local 255 — Calgary; Michael Cacciola, IAFF Local 854 - New York; Andy Arredondo, IAFF Local 493, Phoenix; Don Stewart, MD, IAFF Local 2068 — Fairfax County, Jill Craig, IAFF Local 975 — Austin, George Cruz, IAFF Local 1014 — Los Angeles County, Melissa Kennedy, IAFF local 27 - Seattle, Derrell Mendenhall and Sue Shepard IAFF Local 416 - Indianapolis. We can never forget and will always remember our friend, committee member and IAFF Peer Fitness Trainer Instructor Marty Hauer, IAFF Local 1747, Kent, Washington who contributed to this manual and maintained his deep concern for the health, wellness and fitness of all fire fighters and emergency response personnel up to the day he died — June 3, 2008.

Finally, we also wish to recognize the special experts we utilized during the process: Pat Gucer, MA, University of Maryland; Melissa McDiarmid, MD, MPH, Associate Professor of Medicine, University of Maryland; and Marty Sonnenberg for video productions and the final format of the manual and DVD.

The completion of this project could not have been possible without the professionalism and commitment of everyone involved. We recognize and applaud every member of this group for all the hard work they have done throughout the past two years. Our organizations will remain committed to continue developing programs to improve the quality of life of all fire fighters and emergency medical personnel.

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MISSION STATEMENT

Every fire department in cooperation with its local IAFF affiliate must develop an overall wellness/fitness system to maintain uniformed personnel physical and mental capabilities. While such a program may be mandatory agreement to initiate it must be mutual between the administration and its members represented by the local union. Any program of physical fitness must be positive and not punitive in design; require participation by all uniformed personnel in the department once implemented; allow for age, gender, and position in the department; allow for on-duty-time participation utilizing facilities and equipment provided or arranged by the department; provide for rehabilitation and remedial support for those in need; contain training and education components, and, be reasonable and equitable to all participants. The program must address the following key points.

- Confidentiality of behavioral, medical, and fitness evaluations
- Physical fitness and wellness programs that are educational and rehabilitative, and not punitive
- Performance testing that promotes progressive wellness improvement
- Commitment by labor and management to a positive individualized fitness/wellness program
- Develop a holistic wellness approach that includes:
 - Medical evaluation
 - Fitness
 - Rehabilitation
 - Behavioral health
- The program should be long term, and, where possible, be made available to retirees.

CHAPTER 1 — Introduction

THE FIRE SERVICE JOINT LABOR MANAGEMENT WELLNESS-FITNESS INITIATIVE

This chapter highlights the following:

- The Initiative
- What is Wellness?
- Uniformed Personnel and Wellness
- The Union and Wellness
- Fire Chiefs and Wellness
- Community Support for Wellness
- Financial and Administrative Commitment
- Overview of Document Content

THE INITIATIVE

The Fire Service Joint Labor Management Wellness-Fitness Initiative is a historic partnership between the IAFF and the IAFC as a way to improve the wellness of fire department uniformed personnel. Ten public professional fire departments from the United States and Canada participated. Each of these departments committed themselves to this Wellness-Fitness Initiative by requiring mandatory participation of all of their uniformed personnel in this program. This intrepid move to commit labor and management to the wellness of their uniformed personnel will carry the fire service into the 21st century.

The Fire Service Joint Labor Management Wellness-Fitness Initiative is a non-punitive program.

In 2007, a new brand and logo was established for the Fire Service Joint Labor Management Wellness-Fitness Initiative and is known as the WFI with the following logo:



All WFI products, including the Initiative, the CPAT and the Peer Fitness Trainer Certification, as well as any new programs such as the Fire Fighter Survival Program will bear this new name and logo.

The intention of the WFI is that its implementation should be a positive individualized program that is non-punitive. All component results are measured against the individual's previous examinations and assessments and not against any standard or norm. However, medical practice standards may be used when results indicate that life saving intervention is required.

Confidentiality of medical information is the most critical aspect of the WFI. The unauthorized release of personal details which may be recorded as part of a medical evaluation causes legal, ethical, and personal problems for the employee, employer and examining physician. All information obtained from medical and physical evaluations should be considered confidential, and the employer will only have access to information regarding fitness for duty, necessary work restrictions, and if needed, appropriate accommodations. Also, all medical information must be maintained in separate files from all other personnel information.

WHAT IS WELLNESS?

Wellness is a term that refers to an individual's state of mind as well as their physical state, balancing between health and physical, mental, emotional and spiritual fitness. The concept of wellness also entails having access to rehabilitation, when indicated. Moreover, wellness should be an interactive process where an individual becomes aware of and practices healthy choices to establish a balanced lifestyle.

In fire departments wellness programs are intended to strengthen uniformed personnel so that their mental, physical, and emotional capabilities are resilient enough to withstand the stresses and strains of life and the workplace.

A wellness program should not be perceived as just another program, but rather as a complete commitment to the health, safety and longevity of all uniformed personnel; productivity and performance of all fire crews; and cost effectiveness and welfare of all fire departments. The Initiative is considered a total program, where all components must be implemented for the benefit of both the individual and department.

UNIFORMED PERSONNEL AND WELLNESS

Fire fighting continues to be one of the most dangerous occupations in the United States and Canada. Research reveals the need for high levels of physical fitness to safely perform the necessary duties of the fire service. The long hours, shift work, sporadic high intensity work, strong emotional involvement, and exposure to human suffering places fire fighting among the most stressful occupations in the world. High levels of stress, intense physical demands, arduous work and short and long-term exposure to chemicals and infectious disease contribute to heart disease, lung disease and cancer, which are the three leading causes of death and occupational disease disability.

Wellness is important concept for all uniformed personnel. In many departments, some individuals may gravitate to job tasks other than fire fighting due to personal necessity

or interest and can include: EMS activities; rescue; hazardous materials response; or fire investigations. However, all tasks include significant physical and emotional stresses.

Wellness is a personal commitment that all uniformed personnel must make to survive and to sustain a successful career in the professional fire service. When uniformed personnel are ill or injured, malnourished or overweight, over stressed or out of balance, it affects their ability to effectively do their job.

There are many benefits of wellness for uniformed personnel and include greater strength and stamina; weight reduction and/or maintenance; lower cholesterol and blood pressure levels; decreased risk of death, injury, or disability from disease; increased job performance and work satisfaction; improved physical performance; better posture and joint functioning; reduced anxiety, stress, tension, and depression; increased energy, general vitality, and mental sharpness; enhanced self-esteem and self-image; improved sleep; enhanced capacity to recover from strenuous and exhaustive work; increased homeostasis ability; and improved mobility, balance, and coordination.

THE UNION AND WELLNESS

In implementing wellness-fitness programs unions must assume a leadership role for their members. Traditionally, safety in fire fighting entailed purchasing the latest equipment, such as new apparatus, protective clothing, or PASS alarms. Yet, the most important component in responding to emergencies is the fire fighter and EMS provider. The definition for safety in fire fighting must expand to include a wellness-physical fitness program for uniformed personnel. Unions must work to ensure that uniformed personnel have the opportunity to attain and maintain a healthy body and mind so they can perform their work duties to the best of their abilities.

The responsibility for a wellness-fitness program is not simply the responsibility of management, but should have union input and cooperation in the process. Without union participation in establishing such a program there will be limited or no member “buy in” to the program. A wellness-fitness program must be collaborative between labor and management and is educational and rehabilitative and not punitive in nature.

Fire fighter unions work hard to improve the economic status of their members. A quality wellness-fitness program will help all members perform their duties, while allowing them to enjoy the fruits of their labor when they retire.

FIRE CHIEFS AND WELLNESS

As previously stated, wellness is a commitment that all uniformed personnel must make to meet the demands and rigors of the job. It is the fire chief’s job to ensure that excellent customer service is delivered to the community by healthy uniformed personnel. In order to achieve such a workplace uniformed personnel can enhance their performance in an environment where workplace safety, regulatory compliance, and positive attitudes exist.

Wellness is the fire chief’s commitment to the overall quality of life of uniformed personnel. It is also a commitment to the health of uniformed personnel when they come to work, respond to calls, return from calls, go home at the end of their shifts, and retire at the end of their careers. Wellness will facilitate compliance with workplace regulations and improve the responsiveness of fire chiefs to directives from governing political bodies. Finally, in most departments, a fire chief is not only an administrator but also an active fire fighter, subject to the same stresses of heat, dehydration, toxic exposures, and other occupational hazards. Thus, a fire chief’s commitment to wellness serves both personal and professional interests.

COMMUNITY SUPPORT FOR WELLNESS

Every fire incident or response within a community is unique and the ability of uniformed personnel to effectively respond is improved by their level of physical and mental preparedness. A wellness program is a cost effective measure for the community in that injury rates and sick leave usage are reduced, thereby controlling the overtime costs that are associated with filling vacant positions or utilizing other agencies for response. Wellness programs can facilitate fire department compliance with federal, state, and local laws related to issues such as infectious disease training and testing, as well as breathing apparatus certification. Through utilizing a wellness program to address such issues will eliminate using costly outside consulting agencies, and reducing costs while achieving uniformed personnel wellness. Fire departments with members who are medically, physically, and mentally fit provide better service to their communities while realizing reductions in disability retirements by their uniformed personnel.

FINANCIAL AND ADMINISTRATIVE COMMITMENT

The implementation of a wellness program is not free. However, there may be significant cost benefits to initiating or expanding a wellness program. Wellness programs have repeatedly been shown to provide long-term savings.

Fire department wellness programs make economic sense and by adopting and implementing an occupational wellness program, such as the WFI can reduce occupational claims and costs while simultaneously improving the quality and longevity of a fire fighter’s life; prevent and reduce premature fire fighter musculoskeletal injuries and cardiovascular dis-

ease through a comprehensive health risk screening; avoid passive impacts to reduce off-duty injury/illness costs through health promotion programs. Behavioral health promotion programs will further enhance, complement and improve the cost savings of a comprehensive wellness program.

The fire service's greatest asset is not equipment, apparatus or stations, but rather its personnel. It is through personnel that fire departments are able to serve the public, accomplish their missions, and able to make a difference in the community. A commitment and investment in a wellness program helps to gain the members' trust, which in turn benefits every program and each call answered by the fire department. Therefore, placing a high priority on wellness makes sense for everyone including fire service personnel, tax payers, and the public served.

OVERVIEW OF DOCUMENT CONTENT

■ Overview

The Fire Service Joint Labor Management Wellness-Fitness Initiative has five main components. Each component is significant to the implementation of a wellness-fitness program and lends itself to achieving a holistic approach, the five components are medical; fitness; medical/fitness/injury rehabilitation; behavioral health; data collection and reporting.

■ Structure of Manual

Each of the components is presented as a separate chapter. Each chapter begins with an introduction which explains the need of that component within the context of the WFI. The introduction is followed by a description of the necessary services that should be included to meet the objective of the larger component. Applicable protocols or detailed programs are included or referenced in the document, when appropriate.

■ National Fire Protection Association Standard 1582 and the WFI

The IAFF worked directly with the NFPA as well as the Technical Committee responsible for NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*, to ensure consistency in both documents. IAFF provided copyrighted materials to NFPA, with the provision that the incumbent evaluations mirror the Wellness-Fitness Initiative.

The current NFPA 1582 document (2007 edition) includes a stringent standard for candidate fire fighters, as well as a flexible guide for incumbent fire fighters medical determinations, which are based upon the specifics of their condition, as well as the duties and functions of their job. Job tasks are addressed in Chapter 9, with an explanation of medical conditions that can **potentially** interfere with a member's ability to safely perform essential job tasks and shall be listed by organ system. The key word here is **potentially**.

Most importantly, presence of one or more of the conditions listed in Chapter 9 for incumbent fire department members **does not indicate a blanket prohibition** for the incumbent member from continuing to perform essential job tasks, nor does it require automatic retirement or separation from the fire department. However, it does provide the Fire Department Physicians guidance to determine a member's ability to medically and physically function using an individual medical assessment for the conditions listed in the Chapter.

Conversely, the standard does provide specific requirements for candidates. Unlike the guidance provided for incumbents, the standard provides specific medical conditions that can affect a candidate's ability to safely perform essential job tasks. Candidates with Category A medical conditions are not to be certified as having met the medical requirements of this standard. Candidates with Category B medical conditions can be certified as having met the medical requirements of this standard, only if they can perform the essential job tasks without posing a significant safety and health risk to themselves, other members, or civilians.

The fire department must also document, through job analysis, the essential job functions that are performed in a local jurisdiction and must also determine if that incumbent is expected to perform those tasks, based on assignment and even rank. **Again, there are no blanket prohibitions for incumbent fire fighters.**

It is the responsibility of the physician after an individual medical assessment to state if a member, because of a specific condition, cannot safely perform his/her job, as well as specific tasks that the individual cannot perform. The fire chief must then determine if there are positions within his/her department that the individual can perform, based on that fire departments job analysis for that position.

Foremost, it is essential to recognize that this Standard was fundamentally developed for and intended for physician guidance. The Standard is to provide physicians with advice for an association or relationship between essential job functions of a fire fighter as an individual and his/her medical condition(s). This guidance should be utilized for the best approach towards an individual's risk assessment and management with respect to their medical issue(s) and particular job. Therefore, especially with incumbent fire fighters, it is always important to consider what exactly the fire fighter does while on the job and how those particular tasks will affect his/her performance on an individual basis. ■

CHAPTER 2 — Medical

Management and Labor shall support the provision of the comprehensive mandatory annual medical exams as a component of the WFI Program.

This chapter highlights the following:

- Introduction
- Physical Examination
- Body Composition
- Annual Laboratory Analyses
- Vision Evaluation
- Hearing Evaluation
- Pulmonary Evaluation
- Aerobic/Cardiovascular Evaluation
- Cancer Screening
- Immunizations
- Infectious Disease Screening
- Referrals to Health Care Practitioners
- Written Feedback
- Data Collection and Reporting

INTRODUCTION

The WFI is a progressive model for delivering a preventive and occupational health care services program for today's fire fighters and emergency medical workers (collectively referred to as "uniformed personnel"). The purpose of the WFI is to ensure that uniformed personnel are healthy enough to work safely and effectively during their careers and maintain good health during their retirement. The need for this type of program is based on the unique risks and adverse working environments that uniformed personnel face daily. The intent of the program is that it is implemented as a mandatory, non-punitive program where all uniformed personnel work to improve his or her health or wellness, competing only with themselves.

Due to the physical demands of the job, it is essential that all uniformed personnel maintain a high level of fitness-wellness. In addition, these individuals face unique psychosocial stressors that are a result of the constant exposure to tragic events and suffering. Therefore, the creation of a comprehensive health and wellness program is essential to provide the medical and psychological support needed for uniformed personnel.

Properly implemented, the clinical program outlined in this chapter will allow for an appropriate medical assessment, early detection of diseases and illnesses, as well as implementation of health promotional programs. The annual medical examination is an integral element that provides invaluable health status assessments of both the individual and department wide. Moreover, collecting unidentifiable aggregated data during such exams allows for long-term analysis and the implementation of preventive programs.

Medical Evaluation and Assessment

The medical evaluation outlined in this chapter is intended to accomplish the following to identify whether an individual is physically and mentally able to perform essential job duties without undue risk of harm to self or others; monitor the acute and long-term effects of the working environment of uniformed personnel, including exposure to chemical and biological agents, and the effects of physical and psychosocial stressors in the workplace; detect patterns of disease in the workforce that might indicate underlying work-related health concerns; provide quantifiable medical information on the entire workplace; inform uniformed personnel of their occupational hazards and health status; provide a cost-effective investment in health promotion and disease prevention in the fire service; and to comply with federal, state, provincial and local health and safety requirements.

A comprehensive medical assessment shall be conducted annually and standardized to include all of the components of this chapter. Individuals may use any designated fire department physician, or other providers, to conduct the medical assessment. Uniformed personnel may elect to have certain components of the medical evaluation (i.e. invasive genitourinary examinations) completed by their primary care physician. If this option is chosen, exams given by primary care physicians must be done within the prescribed schedule and the results reviewed by the fire department medical provider and recorded in the member's confidential fire department medical record. All medical assessment results, regardless of where they were obtained or performed, shall remain confidential.

Recently, there have been some varying recommendations on the intervals of medical assessments usually based on an individual's age. However, the value of providing annual medical assessments for uniformed personnel within a high-risk occupation has been determined by the WFI Task Force to be medically significant. It is a cost-effective program, based on a history of saving members' lives through early intervention. The National Fire Protection Association within its health, safety, medical and fitness standards for fire departments has also recognized and specifically requires annual medical assessments.

Medical History Questionnaire

An initial pre-employment history questionnaire for establishing a medical baseline and a periodic medical history to provide follow-up information and to identify changes in health status must be completed during each medical assessment.

Physician Responsibilities

All examining physicians are designated by the department to evaluate patients for the WFI. This continuum of care involves: candidate medical evaluations; annual medical/fitness evaluations; injury/illness care and rehabilitation; pre-retirement medical evaluations (post-retirement exams where provided); and return to work evaluations.

The physician must have a thorough understanding of the positions in the fire department, including: essential job tasks; physical demands; psychosocial stressors; chemical, biological, and physical exposures; and the effects of medical conditions on essential job tasks.

It is important that the physician understand and participate as a member of a multidisciplinary WFI Team. The physician is a vital advisor/consultant to both labor and management on all medical issues.

Physicians must maintain complete adherence to medical confidentiality. Specific information regarding the medical examination, evaluation, laboratory results and medical diagnosis shall not be released unless written permission is obtained from the individual. Employees need to feel assured that the information provided to the physician will not be shared unless consent is granted.

Finally, the fire department physician must have knowledge of local, state, provincial, and federal laws related to health and safety.

PHYSICAL EXAMINATION

■ Vital Signs

A physical examination begins with the assessment of height, weight, blood pressure, temperature, heart rate, and respiratory rate. Blood pressure shall be a part of the baseline and annual examination, with any necessary follow-up as medically indicated. Uniformed personnel with known elevations of blood pressure must be educated about the long-term health effects of ignoring this condition, which includes the possibility of stroke and coronary artery disease.

■ Head, Eyes, Ears, Nose, and Throat (HEENT)

This examination offers an opportunity for the examiner to assess each person's ability to wear head protection, a respirator face piece, and other respiratory protection. The examiner should also review the importance of an uncompromised airway while wearing a respirator. Moreover, it allows for identification of possible chronic exposures that may place the individual at risk for long-term illnesses. The HEENT exam should emphasize early identification of treatable disease and prevention strategies through education. It is also important to note that the examiner has an opportunity to discuss the health hazards of tobacco such as: cancer; cardiovascular disease; lung diseases; premature aging, and tobacco cessation strategies.

The HEENT exam includes a thorough evaluation of: **head** — evaluate the shape of a member's face looking for evidence of previous trauma or other gross abnormality that may interfere with the use of SCBA or other Personal Protective Equipment (PPE); **eyes** — assess extra ocular movements, pupillary light reflex and accommodation, conduct fundi/retinal exam, assess visual acuity, peripheral vision, and color vision; **ears** — visualize the external ear canal and tympanic membrane, inspect the external ear helix particularly for evidence of sun damage or cancerous lesions, and an audiometric exam performed according to standard procedures is also required; **nose** — inspect for patency of nares, septal cartilage deviation, evidence of polyps (usually secondary to chronic inflammation), other mucosal changes (e.g., erythematous patches in smokers), and evidence of tenderness over the paranasal sinuses; **throat** — evaluate the oropharyngeal cavity, gums, teeth, palate (hard and soft), tongue (dorsum and undersurface), tonsils and posterior pharyngeal wall, also direct observation for pre-cancerous changes (e.g., color changes-leukoplakia, plaques, nodules, and asymmetry) is important.

■ Neck

The exam should include evaluation of major vessels, lymph nodes, endocrine structures (salivary and thyroid glands), physiologic functioning (e.g., swallowing, saliva production), assess for abnormal masses, gland enlargement, or suspicious skin lesions. Range of motion of the cervical spine should also be noted.

■ Cardiovascular (CV)

The CV exam must include: assessments of pulse (rate, regularity, and volume); seated blood pressure (with the patient's feet on the floor and the proper sized BP cuff); auscultation of the heart (for heart sounds, extra sounds, clicks, and murmurs) and major arteries (carotid, abdominal aorta, femoral for bruits); and if clinically indicated, examination for signs of decompensating heart function (CHF) such as jugular venous pulse and peripheral (ankle) edema. In addition, a medical assessment must include a thorough history and physical exam. It is imperative to inquire if there are any recent changes in the patient's aerobic capacity, which could indicate pulmonary or cardiac disease. Typically, uniformed personnel suffering from early lung or heart disease will deny being more fatigued while fighting fires. More common is the complaint that during the past year or two the individual's tolerance for exercise has diminished.

The examiner must identify **modifiable** cardiac risk factors such as: smoking; dyslipidemias (including: high total cholesterol/HDL-cholesterol ratio, high LDL-C, high triglycerides, and low HDL-C); hypertension; diabetes; chronic renal failure; metabolic syndrome (insulin resistance syndrome); sedentary lifestyle and/or obesity; and nutritional concerns and/or deficiencies.

Non-modifiable cardiac risk factors should also be noted, such as: male gender; advanced age; and positive family history of premature cardiovascular diseases or risks. For example, individuals with a family history of premature CAD in a first-degree relative are at an increased risk of cardiovascular events.

■ Pulmonary

A pertinent history includes any complaints of exercise intolerance, cough, symptoms of bronchospasm, and exposures (chemical or biological). The respiratory exam should include: an inspection for respiratory rate and effort; presence of coughing or sneezing; skin color and any clubbing of the digits (indicative of respiratory diseases); auscultation for breath sounds and any abnormal sounds (expiratory wheezing, inspiratory crackles, or stridor); and if clinically indicated, more specific exams for areas of consolidation or dullness (pneumonia, pleural effusions, etc.). Spirometry is an effective screening and surveillance exam for pulmonary disease and shall be included in the exam. Any changes in the spirometric indices, such as reductions in the vital capacity and/or forced expiratory volumes should be subject to further evaluation by more formal pulmonary function testing and/or evaluation by a pulmonologist.

■ Gastrointestinal

Gastrointestinal exam shall include inspection, palpation, percussion, and auscultation. Abdominal obesity has been shown to be associated with increased inflammation in the body and concomitant increased risk for several chronic diseases. Palpation for tenderness, organ enlargement, other masses (tumors or hernias), and femoral lymph node enlargement is appropriate. Percussion and palpation of major arteries for bruits and pulse volume (specifically abdominal aortic aneurysms, or weak pulses indicative of arterial atherosclerosis) should also be performed. Generally, the right upper quadrant is palpated for evidence of liver, colon or gall bladder disease; and the left upper quadrant is palpated for spleen or colon pathology. Palpating the right and left lower quadrants is helpful for evaluation of colon disease.

■ Genitourinary

- *Men* — this examination includes testicular, penis, and inguinal hernia evaluations, as well as previously mentioned palpation of femoral pulses and for lymphadenopathy. This part of the examination provides an opportunity for the examiner to discuss the merits of testicular and prostate cancer screening, and techniques for self-examination of the testicles. This exam may be deferred if the patient prefers to obtain these exams from his own primary care physician.
- *Women* - this examination includes vaginal and bimanual pelvic exams, the Pap smear, breast exam, and mammography. This part of the examination provides an

opportunity for the examiner to discuss the merits of breast and cervical cancer screening and techniques for self-examination of the breasts. This exam may be deferred if the patient prefers to obtain these exams from her own primary care physician or women's health care facility.

■ Rectal

The purpose of this procedure is to screen for rectal masses, mucosal abnormalities such as hemorrhoids, anal fissures, and cancerous lesions, and to detect prostate abnormalities in men. All uniformed personnel shall receive annual digital rectal exams (DRE) for detection of lower intestinal masses, prostate gland enlargement (men), atypical prostate tenderness, or surface irregularities and nodules.

■ Lymph Nodes

An examination of the lymph nodes for enlargement, tenderness, and mobility in the cervical, supraclavicular, inguinal, and the axillary regions is to be conducted.

■ Neurological

The neurological examination for uniformed personnel shall include a general assessment of mental status, cranial nerve function, motor system, sensory system, cerebellar function/coordination, balance and gait, and reflexes.

- *Mental Status Exam* — a general mental status exam focuses on orientation, memory (short and long term), and judgment. If clinically indicated refer for psychiatric and/or psychological evaluation for addition assessment.
- *Cranial Nerves Exam* — a focused cranial nerve examination includes an emphasis on the senses. The cranial nerve exam includes: CN1-smell (often omitted unless history of head trauma or toxic inhalation); CN2-vision; CN3-pupillary constriction; elevation of the eyelid; extra ocular eye movements; CN4-extraocular eye movement; CN5-jaw movement; CN6-extraocular eye movements; CN7-muscles of the face; CN8-hearing and balance; CN9-taste; pharynx movements; CN10-movement and sensation in the oropharynx; CN11-movement of the neck muscles; and CN12-tongue movement. A more thorough evaluation may be necessary if clinically indicated (e.g., headaches, dizziness/vertigo, or syncope).
- *Peripheral Nerve Exam* — peripheral nerve function is assessed in the motor and sensory portions of the neurological exam. Decreases and imbalances in muscular power can predispose uniformed personnel to musculoskeletal injuries. Thus, a general (motor assessment as measured by a 0 to 5 subjective rating of power) is important as it pertains to safe and injury-free work performance. The peripheral neurological examination is usually continuous with the cranial nerve evaluation. However, such peripheral motor, sensory, and reflex ex-

aminations may be conducted in conjunction with the musculoskeletal exam.

Motor — gait, heel-to-toe, and Rhomberg (feet together, arms outstretched, palms up and eyes closed) screening examinations for cerebellar function must be conducted. Muscle strength is tested in all major muscle groups. Because of the physical demands on fire fighters, any evidence of decreased muscle strength (as measured on the standard 0-5 scale) raises significant concerns regarding work performance and must be addressed.

Sensory — the examination includes pain, thermal sensation, light touch, position, two point discrimination, and vibratory sensation testing. Thermal evaluations are generally omitted if the pain examination is normal.

Reflexes — this examination includes the standard evaluation of reflexes on a 0-4+ scale, including the ankle, knee, bicep, tricep, and brachioradialis.

■ Musculoskeletal

In addition to the motor assessment, the examiner inspects and palpates for: structural asymmetries (e.g. areas of muscular imbalance and atrophy); active range of motion of all major joints (including the back); the sensation of pain with any of the above; and a complete joint specific examination where clinically indicated. Any musculoskeletal limitations or areas of pain are important to note, not only for the timely provision of physical therapy, but to record those injuries that may be relevant to future workers' compensation, pension, or disability claims.

■ Skin

The examiner shall inspect the skin for color, vascularity, lesions, and edema. Careful examination of the skin for abnormal/atypical nevi (moles) or other suspicious lesions that could be cancerous (non-melanoma or melanoma types) is critical. The clinician should have a low threshold for referring a patient to a dermatologist when suspicious or atypical changes are present. Also note any rashes, scars, tattoos, or obvious evidence of trauma/injury (bruising, excoriations, scrapes, cuts, swelling, erythema, warmth, or tenderness).

BODY COMPOSITION

Body composition differentiates between the relative amounts of adipose tissue (fat) and lean body mass. Lean body mass consists of muscle, bone, organs, nervous tissue, and skin. Body fat is traditionally thought of as a passive tissue that serves to insulate and protect the body and its organs, and as a reservoir for energy storage. Although some body fat is considered essential, excess body fat increases the workload and amplifies heat stress by prevent-

ing the efficient dissipation of heat when a person exercises. In addition, added body fat elevates the energy cost of weight-dependent tasks such as climbing ladders and walking up stairs, also contributing to injuries and an increased risk of many chronic diseases. Obesity is overtaking smoking as the number one cause of preventable deaths and is associated with an increase in almost every chronic disease including but not limited to: cardiovascular disease, hypertension, dyslipidemia, heart failure, diabetes, several types of cancer, asthma and chronic lung diseases, obstructive sleep apnea, dementia, arthritis, and gastroesophageal reflux disease.

■ Evaluation of Body Composition

Methods for evaluating body composition include: circumferential measurements, hydrostatic weighing, Bod Pod, bioelectrical impedance analysis (BIA), skinfold measurement, and body mass index (BMI).

The accuracy, reliability and practicality of these methods vary. There is ongoing research on the most accurate and consistent method for evaluating body composition. However, the WFI has selected the skinfold measurement evaluation as the preferred method of estimating body composition.

■ Distribution of Body Fat

Recent scientific research suggests that the distribution of body fat is an important predictor of negative health outcomes. Individuals with more intra-abdominal/visceral fat, which is fat around abdominal organs, are at an increased risk of hypertension, type 2 diabetes, dyslipidemia, coronary artery disease, and premature death. This visceral adipose tissue is metabolically different than subcutaneous fat. Excessive abdominal fat, as revealed by waist circumference measures, creates increased inflammation in the body. This occurs because fat cells release pro-inflammatory cytokines, cell signaling molecules that activate the immune system, which 'turns on' an inflammatory cascade at genetic and cellular levels, ultimately affecting the entire body. This is important because current scientific research links chronically increased inflammation to several chronic disease states such as cardiovascular disease, pre-diabetes/diabetes, cancer, and dementia, and others.

Thus, abdominal fat is no longer thought of as just a passive or inert reservoir for storing energy; it is an active endocrine organ, secreting many factors capable of increasing systemic inflammation within the body. Expert consensus indicates that a waist circumference measurement, measured at the level of the iliac crests, that is greater than 102cm (40 inches) in men, and 88cm (35 inches) in women imparts a significant increase in the risk of chronic disease, including cardiovascular disease. Obesity, and in particular abdominal obesity, is a health risk that must be managed aggressively.

ANNUAL LABORATORY ANALYSES

Prior to reporting to a physician for an annual medical examination, uniformed personnel may have their blood drawn and urine sampled and analyzed at a designated laboratory site. Having the lab results available at the time of the physical exam will assist physicians in providing a more thorough examination and allowing physicians to address any concerns based on the laboratory results. If blood is drawn and urine sampled during the annual examination, results are provided to physicians for a follow-up and/or addressed in the Health Risk Appraisal.

■ Blood Analysis

The following are components of the blood analysis. At a minimum, laboratory services must provide these components in their automated chemistry panel (CMP) and complete blood count (CBC) protocols. If laboratory tests are not done prior to the scheduled physical examination, laboratory tests will be drawn at the time of the medical examination.

Blood drawn for medical analysis *will not* be used for drug screening at any time.

The minimum blood analysis to be conducted as a part of the annual medical examination, includes: white blood cell count (with differential); platelet count; red blood cell count (hemoglobin and hematocrit; liver enzymes (AST, ALT, LDH) and function (alkaline phosphatase, bilirubin, albumin) tests; glucose — fasting; creatinine and glomerular filtration rate (GFR); blood urea nitrogen; sodium; potassium; carbon dioxide; total protein; calcium; lipids (cholesterol and triglycerides) — fasting

• *White Blood Cell Count*

White blood cells (WBC) are an important part of the body's immunologic system. The role of white blood cells is to help the body defend itself against infection.

An elevated WBC count may suggest an acute bacterial or viral infection, various leukemias, acute blood loss, renal failure, pregnancy, or an inflammatory disorder (such as inflammatory bowel disease), or it may indicate the effects of acute severe emotional/physiological (e.g., burns, trauma) stress on an individual. Situations where the WBC count is low can include: chronic viral or bacterial infection, acute leukemias, immunosuppressive disorders (e.g., HIV), autoimmune diseases (e.g., lupus), chemical and heavy metal toxicities, drug effects (e.g., some antibiotics and analgesic medications), and perhaps chronic emotional stress (which could be construed as 'normal' depending on the circumstances of the individual). The WBC differential helps to determine the significance of an abnormal WBC count.

• *Differential*

The WBC differential identifies relative amounts of different types of white blood cells and helps to identify different clinical problems. For instance, a high neutrophil count might indicate: an acute bacterial infection; presence of immature neutrophils (bands) could mean acute leukemia; excess eosinophils may indicate a parasitic infection or allergic reaction; or an increase in lymphocytes may indicate a chronic inflammatory condition, infection or chronic type of leukemia.

• *Red Blood Cell Count*

The purpose of red blood cells is to carry oxygen to the body's tissues. The routine measures of the blood's oxygen carrying capacity are hemoglobin and hematocrit. An increase in the number of RBC's may indicate dehydration, a myeloproliferative disorder called polycythemia, or conditions of hypoxia such as emphysema and smoking. Decreased levels may indicate anemia, acute blood loss, or hemodilution.

• *Platelet Count*

Platelets are essential to the blood's ability to properly clot. Abnormally low platelet counts, known as thrombocytopenia, may be caused by a decrease in production possibly stemming from bone marrow suppression, clumping or destruction of platelets from sequestration in the tiny capillaries of the spleen. High platelet counts are associated with myeloproliferative disorders such as polycythemia, essential thrombocytosis, or chronic myelogenous leukemia.

• *Liver Enzymes and Function Tests*

The following liver assessment tests are used primarily to detect and monitor liver disease. These tests measure either liver injury (enzymes, also referred to as liver transaminases) or liver function. An increasingly common cause of elevated liver enzymes is fatty infiltration of the liver, due to obesity, referred to as 'non-alcoholic fatty liver disease.' Abnormal results are caused by many other medical conditions or medical treatments.

Aspartate aminotransferase (AST) — is distributed through many tissue types with high concentrations in liver, heart, skeletal muscle, and kidney. It is elevated in liver conditions of infection (hepatitis), obstruction (e.g., gall bladder stones), cirrhosis, fatty infiltration, myocardial stress (acute MI, infection, heart failure), skeletal muscle trauma or vigorous exercise, medication use (e.g., acetaminophen or isoniazid), or alcoholism. Low levels are due to vitamin B6 deficiency, renal failure, or protein deficiency/malabsorption.

Alanine aminotransferase (ALT) — is typically elevated in liver disease, although there are small amounts of this enzyme in heart, kidney, and muscle

tissues. It is more liver specific than is AST. Typically alcoholism, hepatitis, obstructive jaundice, liver cancers, cirrhosis, acute MI, trauma to skeletal muscle, and salicylate (ASA) toxicity can cause ALT elevation.

Lactate dehydrogenase (LDH) — is an enzyme present in all cell types and is released when they are damaged. It is elevated in liver disease, malignancy, hemolytic anemia (rupture of red blood cells), pulmonary infarct, muscular or myocardial injury, or trauma.

Alkaline phosphatase (Alk Phos) — is present in high concentrations in growing bone and in bile. It is elevated in diseases involving the liver, especially any disease process that impairs bile formation or flow (e.g., hepatic duct blockage with stones, metastatic carcinoma of liver), thus it is a liver 'function' test. Diseases of the bone (e.g., bone metastases, Paget's disease, osteomalacia, rickets, hyperparathyroidism, healing fracture, or myositis ossificans) also increase this enzyme. Decreased levels might indicate hypothyroidism, very low fat/low protein diets, zinc deficiency, excessive vitamin D intake, or blood type A.

Bilirubin — is formed when RBC's break down and release their bilirubin (heme metabolism), which is then conjugated in the liver for excretion in the bile. High levels of bilirubin in the blood may be due to abnormalities of formation, transport, metabolism, and excretion. This makes bilirubin a liver 'function' test. Jaundice results from high bilirubin concentrations in the serum. Elevated bilirubin levels are classified as unconjugated or conjugated hyperbilirubinemias. Unconjugated (indirect) hyperbilirubinemias are caused by: increased bilirubin production (e.g., hemolytic anemias or reactions); impaired bilirubin uptake by the liver (due to certain drugs); or impaired conjugation (Gilbert's disease is a common cause of elevated bilirubin which is caused by a decreased level of a conjugation enzyme). Conjugated (direct) hyperbilirubinemias result from: impaired excretion of bilirubin from the liver due to hepatocellular disease (hepatitis, cirrhosis); intrahepatic cholestasis (blockages within the liver) from drugs, sepsis, and hereditary cholestatic syndromes; or extrahepatic biliary obstruction.

Albumin — is a protein made by the liver, thus it is a liver 'function' test. Decreased levels of albumin can be the result of: liver disease or dysfunction (e.g., hepatitis, cirrhosis, necrosis, fatty liver); malnutrition; malabsorption; alcoholism; some chemical and heavy metal toxicities; systemic infections; chronic inflammation; insulin resistance; obesity; autoimmune diseases; renal diseases (nephrotic syndrome, glomerulonephritis); congestive heart failure; overhydration; leukemia; or

pregnancy. Albumin may be high with dehydration, shock, and prolonged tourniquet use during venipuncture, and with steroid therapy.

• **Glucose**

Glucose in adequate levels is essential for all normal body functions. Cells use glucose as a fuel substrate for the production of adenosine triphosphate (ATP), the basic source of energy used in all metabolic reactions — both anabolic (synthetic reactions that convert simple molecules into larger more complex molecules) and catabolic (reactions that breakdown or degrade larger molecules into simpler ones). Insulin is a hormone that regulates glucose metabolism. Diabetes results from a lack of insulin, a lack of sensitivity to insulin or both. Blood glucose may be tested in a multi-step process to determine if one has diabetes or is at risk of developing diabetes. Fasting blood glucose levels are easier to interpret than are random levels although both measurements may be useful in the diagnosis of diabetes.

• **Creatinine (Cr)**

This is a measure of renal function. It is a product of muscle metabolism that is produced in the blood stream at a relatively constant rate and cleared by renal excretion. The kidney filters blood through millions of sieves, glomeruli, which retain essential components of the blood in the body followed by selectively reabsorbing anything that was missed by the glomeruli in the renal tubules. Creatinine is freely filtered by the kidney and not reabsorbed by the renal tubules. It is not a perfect indicator of renal function as other factors can alter serum creatinine measurement. Conditions causing elevation of creatinine include: the use of drugs, such as aspirin, cimetidine, trimethoprim, cephalothin, and cefoxitin; ketoacidosis; and increased protein intake or muscle mass. Conditions causing decrease of creatinine include: advanced age due to physiological decrease in muscle mass; cachexia, due to pathological decrease in muscle mass caused by cancer and malnutrition; and liver disease, due to a decrease in hepatic creatinine synthesis and cachexia.

• **Glomerular Filtration Rate (GFR)**

This is the best index of overall kidney function and is a more sensitive, and early, indicator of kidney dysfunction than creatinine alone. Creatinine clearance, done with 24 hours of urine collection, is the usual means of estimating GFR. Urine collection for a full 24 hours is impractical for patients and prone to error. Many laboratories now estimate GFR using the modified MDRD GFR equation which uses the patient's age, gender, race, and measured serum creatinine level. This estimate of GFR is often included with the serum creatinine on the laboratory results chart.

• **Blood Urea Nitrogen (BUN)**

Urea is another useful index of renal function. It is synthesized mainly in the liver and is the end product of protein catabolism. The kidney excretes this nitrogenous waste

product of protein catabolism. Kidney damage reduces its excretion and is a marker of renal failure and disease.

Urea is freely filtered by the kidney with approximately 30-70 percent being reabsorbed in the renal tubules, but is dependent upon the hydration status of the individual. The reabsorption of urea may be decreased in well-hydrated individuals, causing a low BUN level; whereas dehydration causes increased reabsorption causing a higher BUN level, as is often seen after a prolonged fast with little water intake.

A normal BUN: creatinine ratio is 10:1; with dehydration the ratio can increase to 20:1 or higher. There are conditions other than renal disease that affect BUN, independently of GFR. Circumstances which could increase BUN include: conditions that reduce the effective circulating blood volume (e.g. dehydration, congestive heart failure, or acute blood loss/shock); catabolic states (e.g. gastrointestinal bleeding or corticosteroid use); high protein diets; and drugs such as tetracycline, analgesics, or Nais. Circumstances which could decrease BUN include: liver disease; malnutrition, low protein diet and cachexia; and over hydration.

• **Sodium**

Sodium is an important electrolyte in the body. Abnormal serum sodium does not necessarily mean a problem with the sodium ion balance, but is most often due to abnormal water balance, generally associated with abnormal serum osmolality and shifts of water across the cell membrane. The most common and complicated disturbance of sodium is hyponatremia, low sodium concentration. Generally it results from water imbalance, not sodium imbalance; and its differential diagnosis starts with measurement of the patient's serum osmolality as low, normal, or high, then determination of their extracellular fluid volume as low, normal, or high. The most common reasons for hyponatremia can include situations where the patient's serum osmolality is low and their volume status is low or normal. If their volume status is low, hypovolemia, it may be the result of: dehydration; vomiting; or diarrhea which causes extrarenal salt losses; certain medications such as diuretics and ACE inhibitors, or in aldosterone deficiencies. If volume status is normal, hyponatremia is usually due to the syndrome of inappropriate antidiuretic hormone secretion (SIADH). Patients who are hypervolemic, in edematous states, with hyponatremia have congestive heart failure, liver disease, nephritic/nephrotic syndrome, or advanced renal failure.

Hypernatremia, high sodium concentration, occurs most commonly when free water intake has been inadequate. This is not an exhaustive list of causes for hypo/hypernatremia and specialist consultation may be appropriate.

• **Potassium**

Potassium is another important electrolyte in the body, with 95 percent of potassium residing inside cells. The plasma potassium concentration is maintained in a narrow range through two main regulating mechanisms: potassium shift between intracellular and extracellular compartments; and modulation of renal potassium excretion. Potassium levels may be elevated, known as hyperkalemia, in patients taking certain medications that inhibit potassium excretion: ACE inhibitors, angiotensin receptor blockers, potassium sparing diuretics, or their combination. Other medications that can cause hyperkalemia include: NSAIDs, trimethoprim, tacrolimus, and heparin. Otherwise the causes of hyperkalemia involve clinical situations where there is: decreased excretion of potassium, shift of potassium out of cell, spurious causes or if there is excessive intake of potassium.

Low potassium levels, called hypokalemia, in situations where there is decreased potassium intake, potassium shift into the cell (alkalosis, excess insulin, or trauma), renal potassium loss (aldosterone deficiency, therapy with diuretics such as furosemide and thiazides, hypomagnesemia, renal tubular acidosis), or if there is extrarenal potassium loss (vomiting, diarrhea, or laxative abuse). This is not an exhaustive list of causes for hyper/hypokalemia and specialist consultation may be necessary.

• **Carbon Dioxide (Bicarbonate)**

Carbon dioxide levels are an indicator of the acid-base status of the patient. The measurement of venous carbon dioxide is actually a direct determination of the bicarbonate anion concentration. Therefore, for clinical purposes the total carbon dioxide content is equivalent to the bicarbonate anion concentration. Disturbances in acid-base balance can be caused by a variety of primary metabolic and respiratory disorders (more acute situations), or they can be due to a combination of the two (in more chronic situations where there has been compensation for the primary disorder). Primary respiratory disorders affect blood acidity by causing changes in the arterial partial pressure of carbon dioxide, and primary metabolic disorders are indicated by changes in the bicarbonate anion concentration. The medical workup of the patient with an acid-base disorder is complicated and may require specialist consultation.

• **Total Protein**

Total protein is a measure of the total proteins in the serum (albumin and globulins). Plasma also contains fibrinogen protein so if the lab result is high, ensure that the serum was measured and not the plasma. Total protein levels can be elevated in chronic infection, chronic liver disease, alcoholism, dehydration, multiple myeloma, lymphoma, and some autoimmune diseases. Levels are low in malabsorption, malnutrition, severe liver disease, chronic renal failure, nephrotic syndrome, overhydration, and protein losing states.

• **Calcium**

Calcium is measured in the serum or plasma and is required for normal muscle contraction and nerve function. It is the ionized calcium in blood that is usually measured, and any variation from the normal range is usually highly significant. Calcium is usually elevated, known as hypercalcemia, due to primary hyperparathyroidism or a malignancy (e.g., multiple myeloma, lymphoma, or tumors that secrete PTH). These two reasons account for 90 percent of all cases of high calcium. Other causes of hypercalcemia are: increased intake or absorption of antacids or excess vitamin D or A; other endocrine diseases such as adrenal insufficiency, or pheochromocytoma; sarcoidosis; Paget's disease of the bone; drugs such as thiazide diuretics or lithium; and conditions leading to immobilization.

Ionized calcium may be low, hypocalcemia, in conditions where there is insufficient action of PTH (e.g., hypoparathyroidism) or active vitamin D. The most common cause for low total calcium is low albumin states (where correction, by the lab or with a formula, of the serum calcium concentration is needed to accurately reflect the ionized calcium concentration). The most common cause of hypocalcemia is renal failure due to decreased production of vitamin D. Other important causes include: decreased intake from malabsorption or vitamin D deficit; increased loss resulting from diuretics or alcoholism; hyperphosphatemia; and sepsis. The medical workup of the patient with hyper/hypocalcemia can be complicated and may require specialist consultation.

• **Lipid Tests**

A full lipid panel is a critical component of the laboratory testing profile for the WFI. In the general population, a positive correlation between plasma cholesterol and coronary risk has been well documented. Fire fighters are at an even higher risk of cardiovascular events in the course of their duty, especially during fire suppression. Among fire fighters, almost half of line-of-duty deaths can be attributed to cardiovascular events. Hypercholesterolemia is one of the major modifiable risk factors in efforts to prevent coronary artery disease and cardiovascular events.

Total Cholesterol— cholesterol belongs to a larger family of biological chemicals called lipids (fats). Because it is such a critically important substance, a complex carrier system has developed to move cholesterol through the entire body. This system consists of a number of proteins that bind to cholesterol and transport it to where it is needed. Cholesterol, a lipid, when bound together with one of these carrier proteins, is called a lipoprotein. Both total cholesterol and carrier proteins can be measured in blood samples. When looking at total serum cholesterol levels, the risk of developing atherosclerotic coronary vascular disease increases as the total cholesterol level increases.

Low Density Lipoprotein (LDL-C) level — LDL-C is 45 percent cholesterol by weight and is the major carrier of cholesterol to the body's tissues. Since LDL can deliver too much cholesterol to the wrong places (like the heart arteries) resulting in cholesterol plaque build-up, people often refer to this as a bad cholesterol.

High Density Lipoprotein (HDL-C) level — HDL-C is 30 percent cholesterol by weight and is involved in reverse transport of cholesterol away from body tissues and out of the body. HDL cholesterol removes excess cholesterol from the arteries, helping to prevent the build-up of cholesterol plaques. Because this lipoprotein appears to remove excess cholesterol, it is often referred to as the good cholesterol.

Total Cholesterol/HDL Ratio — TC/HDL-C ratio gauges relative risk of cardiovascular disease. The importance of the protective effect of HDL cholesterol is emphasized by this ratio. The total cholesterol level may be within a normal range but combined with low HDL cholesterol level, the ratio indicates the individual is at a higher risk than someone with normal total cholesterol and a normal HDL level.

While cholesterol tests are part of the annual examination, the WFI strongly recommends that a fasting lipid profile be conducted at least once every five years. Further, a non fasting total cholesterol > 200 or HDL cholesterol < 40 indicates the need for a fasting lipid profile.

Risk factors for cardiovascular disease that need to be considered in the interpretation of results and in further determining additional fasting lipid profile testing include age ≥ 45 years for males and ≥ 55 years for women, current cigarette smoking, hypertension, HDL cholesterol below 40 and a family history of premature coronary heart disease defined by a definite myocardial infarction or sudden death before age 55 years in a male first-degree relative and before age 65 in a female first-degree relative. A desirable LDL level in individuals without identifiable coronary heart disease is < 160 mg/dl with zero risk factors and < 130 mg/dl for two or more risk factors. The desirable LDL cholesterol level for those individuals with known coronary artery disease or risk equivalents including symptomatic carotid artery disease, peripheral arterial disease, abdominal aortic aneurysm, and diabetes mellitus is < 70 mg/dl.

Given the increased physiological demand imposed by the fire service, cholesterol lowering therapy including lifestyle modification and medication when necessary is recommended for the achievement and maintenance of desired cholesterol levels.

■ Metabolic Syndrome

Metabolic syndrome also referred to as *syndrome X*, *insulin resistance syndrome*, and *pre-diabetes*, is characterized by dysfunctional metabolic factors probably linked by a common underlying mechanism. From a clinical standpoint, diagnosing the metabolic syndrome identifies individuals who are at increased risk for cardiovascular disease, including coronary heart disease, stroke, and peripheral artery diseases and/or type 2 diabetes.

Metabolic syndrome is characterized by a clustering of risk factors for cardiovascular disease that include: insulin resistance (reduced cellular insulin action); abdominal obesity; atherogenic dyslipidemia (changes to lipids that promote atherosclerosis which include a combination of elevated triglyceride levels and atherogenic low-density lipoprotein (LDL) cholesterol particles; and low levels high-density lipoprotein (HDL) cholesterol); hypertension; hyperuricemia (high serum uric acid); a prothrombotic state (enhanced blood clotting); and a proinflammatory state (increased systemic inflammation). While many factors such as insulin resistance, abdominal obesity, physical inactivity, hormonal imbalances, and a poor diet are likely the prime factors in the development of metabolic syndrome, genetic factors (especially family history of type 2 diabetes) also play a role in its pathogenesis.

Individuals with metabolic syndrome are at increased risk for the development of coronary heart disease and other diseases related to plaque buildup in artery walls, such as stroke and peripheral vascular disease, as well as type 2 diabetes mellitus. Prospective population studies show that compared to individuals without metabolic syndrome, those who have it are at least double the relative risk for cardiovascular disease events, and a 5-fold increase in the risk of developing type 2 diabetes.

Therefore, it is important to identify those with metabolic syndrome and refer for treatment. The metabolic syndrome is identified by the presence of three or more of the following components[4]: abdominal obesity defined as a waist circumference >102 cm (>40 in) in men or >88cm (>35 in) in women; triglycerides ≥150 mg/dL; HDL cholesterol <40 mg/dL for men or <50 mg/dL for women; blood pressure ≥130/85 mmHg; and fasting glucose ≥110 mg/dL.

■ Heavy Metal and Special Exposure Screening

Baseline testing for heavy metals and special exposures may be performed under special circumstances, such as hazardous materials exposures; recurrent exposures; other known exposures; or where under federal, state, or provincial regulations requires it, such as OSHA standards.

The following screenings may be utilized: urine screen assesses exposure to arsenic, mercury and lead; blood screen

for lead and zinc protoporphyrin assesses exposure to lead; testing and screening for specific exposure or other heavy metal screens may include aluminum, antimony, bismuth, cadmium, chromium, copper, nickel and zinc; and special blood testing may be ordered for organophosphates, RBC cholinesterase, or other toxic exposures such as blood screening for exposure to PCBs.

■ Urinalysis

Urinalysis will include both dip stick and/or laboratory microscopic evaluations.

The urine sample received for this analysis **is not intended to be and will not be** used for drug or alcohol use screening at any time.

• Dip Stick Urinalysis

pH — is the relative acidic or basic state of the urine can be an indication of infection or chemical exposure.

Glucose — excess glucose is seen in diabetes and renal tubule disease.

Ketones — are abnormally elevated in uncontrolled diabetes, alcoholism, starvation, dehydration, and with some weight reducing diets.

Protein — protein levels in urine can be elevated in kidney or urinary tract diseases including cancers. The clinical significance of elevated protein on dipstick can be determined by performing a 24-hour urine test.

Blood — dip sticks detect hemoglobin from lysed red blood cell and myoglobin. Levels can be elevated with hemolytic anemias, infections, kidney stones, tumors, dehydration, muscle breakdown, and renal disease due to tuberculosis, trauma, glomerulonephritis, or cancer.

Bilirubin — dip sticks may be positive for bilirubin in liver disease, the breakdown of red blood cells, and gallbladder obstruction.

• Microscopic Urinalysis

This includes evaluation for white blood cells (WBC), red blood cells (RBC), WBC casts, RBC casts, and crystals. This testing helps to differentiate various kidney and urinary tract diseases or trauma.

VISION EVALUATION

Assessment of vision must include evaluation of distance, near, peripheral, and color vision. Near visual loss, presbyopia, is common in adults and increases in prevalence with increasing age usually from the mid to late 40s on. Com-

mon visual disorders affecting adults include cataracts, macular degeneration, glaucoma, and diabetic retinopathy.

The visual evaluation must include: visual acuity screening for both far vision acuity and near vision acuity; eyes must be tested separately; vision testing to determine both uncorrected and corrected visual acuity; color vision testing must be assessed using color plates, such as Ishihara plates; when peripheral vision evaluations are indicated, protocols specific to the test apparatus, not objects in the field, must be utilized.

HEARING EVALUATION

By nature of their occupation, uniformed personnel are at an increased risk for noise-induced hearing impairment at an earlier age. Baseline and annual audiograms are to be performed on all uniformed personnel. To establish trends in hearing acuity, current audiogram must be compared with all previous audiograms, including the baseline. Testing must be done in an ANSI-approved soundproof booth. Pure tones are presented at various intensities until a threshold is established. For the purposes of database collection, the following frequencies are tested: 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz, 4000 Hz, 6000 Hz and 8000 Hz.

In addition, pure tone threshold testing must be performed separately in both ears and participants must not use hearing aids during testing.

PULMONARY EVALUATION

■ Spirometry

A baseline spirometry must be established in all uniformed personnel who may be required to wear breathing apparatus. A baseline is useful in individuals who have a history of respiratory health problems to use for later comparison. Baselines can also be used in individuals without respiratory disease who later develop respiratory impairment again for comparison purposes. Results can vary depending on patient's effort, maximum effort is required, and proficiency of the test administrator, please note the technician performing this test must be certified in the procedure. The member's age, height, gender, and race/ethnicity is used by the technician to optimally calculate and interpret spirometry results. Significant deterioration, greater than 15 percent from the previous year's test indicates further evaluations.

• Spirogram

Only a spirogram that is technically acceptable and demonstrates the best effort by an individual should be used to calculate Forced Vital Capacity (FVC) or Forced Expiratory Volume (FEV_1).

Forced Vital Capacity (FVC) — if the FVC is lower than 80 percent of predicted, this may indicate obstructive lung disease, restrictive lung disease, or mixed obstructive and restrictive pulmonary disease.

Forced Expiratory Volume (FEV_1) — if the FEV_1 is lower than 80 percent of predicted, this may indicate obstructive, restrictive, or a mixed pattern of obstructive and restrictive pulmonary disease.

FEV_1 /FVC Ratio — can suggest the presence of the following pulmonary diseases: obstructive lung disease if the FEV_1 /FVC ratio is less than 75 percent of predicted; mixed pattern disease if the FEV_1 /FVC ratio is between 75 — 85 percent of predicted and both FEV_1 and FVC are reduced; or restrictive lung disease if FEV_1 /FVC ratio is greater than 85 percent of predicted and both FEV_1 and FVC are reduced.

Annual spirometry is the only cost effective screening test. The following respiratory tests are used when indicated to further evaluate suspected abnormal conditions and are performed in specialized laboratories.

• Peak Expiratory Flow Rate

A low PEFR may indicate obstructive or restrictive lung disease entities such as asthma or chronic obstructive pulmonary disease (COPD), but is most useful as a simple measurement to monitor asthmatic response to therapy. PEFR can be used at home or work to objectively document a patient's symptomatic complaints.

• Pre/Post Bronchodilator

Obstructive disease and mixed obstruction/restriction usually, but not always, responds to a bronchodilator. Restrictive diseases typically do not respond to a bronchodilator. Repeat spirometry after bronchodilator treatment may provide useful information, but is not required for data collection purposes.

• D_LCO

A measurement of diffusing capacity of carbon monoxide. Low D_LCO , less than 70 percent, is seen in interstitial restrictive lung diseases (e.g., asbestosis and sarcoidosis), chronic CO intoxication, and obstructive lung disease, less than 60 percent emphysema. D_LCO is not reduced in bronchitis or asthma.

• Lung Volumes

Are low in restrictive diseases, interstitial or chest wall, and are high in obstructive diseases especially with emphysema.

■ Initial Baseline Chest X-Ray

A baseline chest X-ray is required and useful for an individual with a history of respiratory problems or symptoms. It is also useful in healthy individuals for later comparison in the event that disease develops.

■ Repeat Chest X-Ray

Unless medically indicated, all uniformed personnel are recommended to have a repeat chest X-ray every five years.

The use of chest x-rays in surveillance activities in the absence of significant exposures, symptoms, or medical findings has not been found to reduce respiratory or other health problems. Among uniformed personnel, chest X-ray abnormality may indicate pneumonia, tuberculosis, lung cancer, or other occupational lung disease.

AEROBIC/CARDIOVASCULAR EVALUATION

■ Resting ECG

A resting 12-lead ECG shall be performed annually. It can be useful to diagnose disturbances in rhythm, presence of conduction defects (e.g., heart blocks), or indications of ischemic heart disease (e.g., ST segment depression or elevation, T-wave inversions, or Q-waves). Further investigation may be necessary if any abnormality is seen, or if there is a significant change in the ECG from the previous year(s).

■ Aerobic/Cardiopulmonary Testing

A cardiopulmonary test shall be done annually, using either a maximal test under the supervision of a physician or a submaximal test using WFI protocols.

The maximal cardiopulmonary test with ECG is performed in a medical facility with proper monitoring by a physician and available resuscitation equipment.

Cardiopulmonary/aerobic tests with heart rate monitoring, rather than ECG monitoring, are conducted on a treadmill or stairmill using the validated protocols contained in Appendix A. Diagnostic information and a calculated VO_2 is obtained from these submaximal tests.

CANCER SCREENING

Appropriate screening examinations: skin, clinical breast examination, Pap smear, testicular examination, Digital Rectal Exam (DRE), Fecal Occult Blood Testing (FOBT), colonoscopy, and bladder cancer examination must be conducted with the annual examination or as indicated below. When such examinations are carried out on a member of the opposite sex or if the member requests, a second health care worker chaperone should be in the room for patient support and medico-legal reasons. Uniformed personnel may, however, choose to have such exams performed by an outside physician. When uniformed personnel use their own physicians for cancer screening examinations, results need to be forwarded to the fire department physician for inclusion in the fire department confidential medical file.

■ Skin Exam

Both melanoma and non-melanoma skin cancers are common and are increasing in incidence. Skin cancer must be diagnosed in a timely manner to ensure successful treatment and maximize cure rates. Comprehensive inspection of the skin, especially in sun exposed areas, is necessary. Inform the patient that taking a photograph of their own skin (especially their back) can help when comparing specific nevi (moles)

or assessing for new or atypical lesions over time. Any suspicious lesions shall be referred for dermatological assessment.

■ Breast Examination

Breast cancer is the most common type of cancer in women and second leading cause of cancer death in women, after lung cancer. Breast cancer incidence and mortality rates increase with age. An annual clinical breast examination is required. Self examination should be encouraged, and educational information should be made available to interested patients.

■ Mammogram

Annual mammography screening shall be performed on all women uniformed personnel beginning at age 40. Women uniformed personnel with a family history of breast cancer or other personal risks shall be provided with appropriate individualized recommendations for breast cancer screening, such as genetic screening or breast MRI. Women uniformed personnel may wish to have an ongoing clinical association with a women's health provider.

■ Pap Smear

Annual Pap smear screening is recommended to screen for cervical inflammation or cervical cancer. The incidence of invasive cervical cancer has been estimated to have decreased 70 percent by screening. In addition to the Pap test — the main test for cervical cancer — the human papillomavirus (HPV) test may be used for screening women aged 30 years and older, or if indicated at any age for those who have unclear Pap test results.

■ Testicular Examination

Testicular cancer represents 1 percent of all cancers in men. It remains the most common cancer in Caucasian men 20 to 34 years old. In general, an excellent prognosis exists with early detection and treatment. Self examination should be encouraged, and educational materials should be made available to interested patients.

■ Prostate Specific Antigen (PSA)

Prostate cancer is the second most common type of cancer in men, after skin cancer. The PSA test is a screening test for prostate cancer. Male uniformed personnel who are considered to be at an increased risk for prostate cancer, such as those who have a family history of prostate cancer or are of African-American heritage, shall have a PSA test annually beginning at 40 years old. All other male uniformed personnel shall have annual PSAs beginning at 50 years old. Several non-cancerous conditions might result in elevated PSA levels including benign prostatic hypertrophy (BPH) and inflammation, or recent prostate gland stimulation resulting from a DRE or ejaculation. Current consensus also highlights the importance of measuring and comparing PSA results over time, known as PSA velocity, where an increase over time would indicate higher

risk for prostate cancer, the magnitude of this increase where risk is increased should be in accordance with current national urological association guidelines.

■ Digital Rectal Examination (DRE)

Any abnormal DRE for male uniformed personnel which could be suggestive of cancer, even if PSA is in a normal range, should be referred to an urologist for a diagnostic workup.

■ Fecal Occult Blood Testing

Fecal occult blood testing is used to screen for colorectal cancer. Testing is done annually in conjunction with the DRE. It is done either in the clinician's office using a stool guaiac card or with stool specimens collected by the patient at home that are applied to the guaiac cards and later analyzed by a laboratory. Multiple different stool samples, usually three, from different days can increase the sensitivity of this colorectal cancer screening test. Diet restrictions do apply to this test.

■ Colonoscopy

Uniformed personnel are exposed to a variety of particulate materials, chemicals and asbestos which can increase the risk for colon cancer. Colonoscopies are used to examine the full lining of the colon and rectum. During the colonoscopy other minor procedures including polyp removal or excising a small piece of tissue for biopsy may be performed. Colonoscopies shall be conducted on all uniformed personnel at 40 years old and repeated every five years. A colonoscopy shall also be performed, regardless of age or schedule, when FOB results are positive or when there is a consistent change in bowel habits.

■ Bladder Cancer Test

As the body absorbs cancer-causing chemicals, they are transferred to the blood, filtered out by the kidneys, and expelled from the body in urine. High concentrations of chemicals in urine can damage the endothelial lining of the bladder and increase the risk of cancer. Because fire fighters are regularly exposed to smoke and chemical fumes, they may be at an increased risk for transitional cell carcinoma (TCC), a cancer of the bladder. Urine is evaluated annually for blood (hematuria), nuclear matrix protein 22 (NMP22) or for telomerase, an enzyme found in bladder cancer cells. Positive dipstick for hematuria, telomerase or NMP22 may indicate referral for upper tract imaging, cystoscopy and urine cytology.

IMMUNIZATIONS

Uniformed personnel must receive, or provide documentation of having received the following vaccinations: Hepatitis A, Hepatitis B, Tetanus/Diphtheria, Pertussis, influenza, MMR, Polio, and Human Papillomavirus (HPV). Pneumovax should be considered for individuals with appropriate risk factors

■ Hepatitis A

Formalin inactivated vaccines made from attenuated HAV strains have been shown to be immunogenic, safe, and

highly effective in preventing Hepatitis A. Previous recommendations only included vaccinations for "high risk" uniformed personnel (e.g., HazMat, USAR, and SCUBA) and those uniformed personnel who are Hepatitis C positive or have exposure to contaminated water. However, since all uniformed personnel are potentially exposed to contaminated water via floods or accumulated water from fire suppression, all uniformed personnel shall be vaccinated. The vaccine is 99-100 percent effective, so serum titers after vaccination are not recommended.

A new combined Hepatitis A and B vaccination is now available. Immune globulin (IG) contains anti-HAV with antibody concentration sufficient to be protective. It is to be administered to uniformed personnel who have not been previously vaccinated before exposure or during the early incubation period. Immune globulin may not prevent infection, but will weaken the effects and may render the infection inapparent.

■ Hepatitis B

Uniformed personnel, by the nature of their occupation, are considered high risk and are therefore required to have this vaccine. The vaccine is effective in preventing HBV infection. Among the less than 90 percent who develop adequate antibody levels after the third dose, vaccine effectiveness is virtually 100 percent. Although antibody levels decrease with time, people with normal immune systems continue to be protected from infection.

Despite the decline of antibody levels with time, routine booster doses and serologic monitoring are not presently recommended for patients with normal immune status. Booster doses are not recommended if a previously vaccinated person with documented immunity is exposed to a known source and if the antibody is now inadequate. Nevertheless, HBV booster can be administered, depending on the protocol. If vaccination was not successful, then hepatitis B gamma globulin must be administered after each exposure. If initial vaccine doses are not sufficient, up to three additional doses can be administered. The following factors — male, over 40 years old, smoker and obesity — are associated with difficulty in HBV antibody conversion following vaccination.

■ Tetanus/Diphtheria

Tetanus and diphtheria occur almost entirely in unimmunized or incompletely immunized persons. Case fatality rates for tetanus are as high as 30 percent and as high as 5 to 10 percent for diphtheria. Immunization records of prior vaccinations are required. Uniformed personnel shall be given tetanus/diphtheria boosters every ten years. For certain high risk wounds, a booster shall be given if five years have elapsed since the last vaccine. Epidemiological studies have indicated that adult immunity to pertussis, whooping cough, is waning. A convenient way to prevent outbreaks of pertussis is to administer a combination Tetanus/Diphtheria/Pertussis vaccine (TDAP).

■ Influenza

The influenza vaccine is 30-40 percent effective in preventing clinical illness and 80 percent effective in preventing death in older adults. Uniformed personnel are in close contact with the public and live in close quarters while on duty and therefore the vaccine is required and must be provided annually, early fall through early winter, for all uniformed personnel.

■ Measles, Mumps, Rubella (MMR)

Measles remains a significant health problem with recent outbreaks attributed to vaccine failure, waning immunity, and erroneous documentation of previous vaccination. Mumps has been increasing in incidence. Use of the rubella vaccine has led to a significant decrease in the incidence of rubella. Rubella is usually a mild illness. However, in pregnant women particularly in the first trimester, it can lead to miscarriage, stillbirth, and congenital rubella syndrome (CRS).

Measles — the measles vaccine is required for all uniformed personnel born in or after 1957, if there is no medical contraindication and no evidence of at least one dose of live vaccine on or after the individual's first birthday. In addition, a vaccination is needed if there is no documentation of a physician-diagnosed disease or if there is no laboratory evidence of immunity. Those born prior to 1957 are presumed to be immune. If in doubt, immunization is appropriate.

Mumps — the mumps vaccine is required for all uniformed personnel who have no documentation of physician-diagnosed mumps, no adequate immunization with live mumps after their first birthday, and no evidence of laboratory immunity. Uniformed personnel born before 1957 are presumed to be immune. Vaccination is needed for uniformed personnel who are unsure of their mumps vaccination history.

Rubella — the rubella vaccine is required for uniformed personnel unless proof of immunity is available. Women who receive the vaccine should not become pregnant for three months after the vaccination is administered.

■ Polio

The polio vaccine has dramatically reduced the annual number of reported cases of paralytic poliomyelitis. The vaccine series is usually given in childhood. It shall be given to uniformed personnel if the vaccination or disease is not documented.

■ Human Papillomavirus (HPV)

The HPV vaccine shall be provided to all women uniformed personnel up to 26 years old, if previous vaccination is not documented.

■ Varicella

Varicella disease, or chickenpox, is a highly contagious childhood disease caused by varicella virus (VZV). A vaccine is now available. As recommended by the American Committee on Immunization Practices (ACIP), susceptible persons 13 years old and older who come into contact with those at high risk for serious complications from VZV disease (e.g., health care workers and those in contact with immunocompromised individuals) should be vaccinated with two doses at least one month apart. Uniformed personnel who have not had varicella are considered high risk due to their occupational exposures.

Uniformed personnel should be screened for immunity levels. The varicella vaccine shall be offered to all non-immune personnel. If immunity to VZV is not documented, gamma globulin may be indicated after exposure.

INFECTIOUS DISEASE SCREENING

■ Hepatitis C Virus

Hepatitis C is a major health concern for employees in the fire service. It is very important to screen for the antibody to the Hepatitis C virus because it can be clinically silent for decades while causing ongoing damage to the liver. Historically, the vast majority of Hepatitis C infections were caused by blood transfusions or IV drugs use.

The prevalence of Hepatitis C infections in the fire service has varied considerably where it has been measured. Medical studies have suggested that new infection (seroconversion) with the HCV in fire service employees is almost always caused by percutaneous injury events such as with contaminated needle sticks. Baseline antibody tests shall be done on all uniformed personnel to check for previous infection or to establish the absence of infection. Be aware that false positive and false negative results may occur. If conversion from negative to positive occurs, expert consultation for specialized treatment protocols is required.

■ Tuberculosis (TB)

TB control depends upon screening high-risk populations and providing preventive therapy to those most likely to develop active disease. Uniformed personnel, by nature of their occupation, are considered to be at increased risk and an annual PPD is required. A new serum test is available and may be considered as an alternative to PPD. If annual conversion rates are high in a given work group, then testing is recommended every six months. A conversion indicates recent exposure to or infection by the tubercle bacillus. Personnel will then need appropriate follow-up and contact investigation as medically indicated. As recommended by the American Thoracic Society and Centers for Disease Control and Prevention, chest X-ray and isoniazid prophylaxis may be needed.

■ Human Immune Deficiency Virus (HIV)

HIV testing is not a part of baseline or annual physicals. However, the test should be offered on a confidential basis

as part of post-exposure protocols and as requested by a physician and patient. All results from HIV tests are provided directly to the patient and will not be maintained in any local or international database.

REFERRAL TO HEALTH CARE PRACTITIONERS

The following will warrant referrals to health care practitioners: abnormal findings on the annual medical exam must be addressed by a medical practitioner follow-up or referral; revaccination or intervention following exposures must be managed by a medical practitioner follow-up or referral; managed care or other provider referrals are appropriate for non-work related medical issues; follow-up on findings from annual examinations must be reviewed by the fire department physician; and return to work determinations require clearance by the fire department physician in conjunction with other specialty evaluations, as needed. The fire department physician will normally function as the “gatekeeper” for medical certification, retaining final authority for return to work/fitness for duty decisions.

WRITTEN FEEDBACK

Written feedback to uniformed personnel concerning health risks and health status is required following the annual examination. Reporting findings and risks and suggesting plans for modifying risks improves the physician-patient relationship and helps uniformed personnel claim ownership of their health.

■ Individualized Health Risk Appraisal

Individualized health risk appraisals must also include questions that attempt to accurately measure the uniformed personnel’s perception of their health. Health perception can be a useful indicator of potential problems.

DATE COLLECTION AND REPORTING

Comprehensive confidential aggregated medical and health information will be collected for the purposes of this Initiative. The complete data protocol is found in Chapter Seven. The following is an overview of the different categories of data to be compiled: demographics, employment status, illness and injury experience, tobacco and alcohol use, current health status, cancer screening, physical activity, physical measurements, lab data, immunizations, and fitness testing.

■ Occupational Exposure

An integrated exposure database that provides the fire department physician timely information on uniformed personnel aids in tracking diseases in individuals and risks in the population. The physician must educate uniformed personnel on the importance of documenting exposures and follow-up care to ensure that the employee gets necessary medical care. The central departmental database on uniformed personnel must include the following: chemical exposures, physical exposures, biological exposures, and all safety and health related incidents. ■

CHAPTER 3 — Fitness

Management and Labor shall work together to provide workout scheduling, resource support, and/or access to resources on duty to support an individualized fitness program.

This chapter highlights the following:

- Introduction
- Medical Clearance
- On-Duty Time for Exercise
- Equipment and Facilities
- Exercise Specialists and Peer Fitness Trainers
- Incorporating Fitness Throughout the Fire Service
- Fitness Evaluations
- Exercise Programs
- Nutrition
- Summary
- Endnotes

INTRODUCTION

Throughout the history of the fire service the proper implementation of fitness programs in fire departments has been extensively debated. Research has demonstrated the need for high levels of aerobic fitness, muscular endurance, muscular strength, muscular power, flexibility, and body composition in order to perform safely and effectively in the fire service. Physical fitness is critical to maintaining the wellness of our uniformed personnel. Fitness must be incorporated into the overall fire service philosophy.

While assessing uniformed personnel's current fitness level is an important part of developing an individualized fitness program, assessment is not, in itself, a fitness program. An effective physical fitness program has several components that must be implemented. The elements necessary for a successful and comprehensive physical fitness program are highlighted throughout this chapter. Appropriate protocols are referenced in Appendix A.

MEDICAL CLEARANCE

Prior to involvement in any exercise regimen, including the WFI fitness assessment, all uniformed personnel must be medically cleared in order to participate.

ON-DUTY TIME FOR EXERCISE

It is necessary to provide dedicated on-duty time for exercise to assist in promoting physical fitness. While scheduling on-duty time may vary due to emergency calls, training, and other duties, it is recommended that 60-90 minutes be allotted for every shift. Uniformed personnel working administrative shifts, 40-hours or otherwise, shall also be provided the opportunity to exercise. The health, fitness, and wellness of all uniformed personnel must be maintained as a priority. This Initiative holds forth the idea that labor and

management should work together through this program to ensure full participation by all uniformed personnel.

EQUIPMENT/FACILITIES

Many models exist to guide departments through the process of supplying and maintaining exercise equipment, whether in every fire station or in regional fitness centers. The following steps detail some strategies that have proven successful.

• Step 1

The equipment should be evaluated for: design, reliability, ease of maintenance, safety, and cost. Moreover, evaluation should be conducted by personnel who will be using the equipment and the peer fitness trainers who will instruct the membership on its correct use. Evaluation information can and should be shared between the participants of this Initiative.

• Step 2

The allocation or raising of funds to purchase the equipment should include funds in the budget process. Other sources are also available to raise funds independent of the traditional budget process, such as FEMA, Assistance to Fire Fighters Grant program, and other federal, state or provincial grants. Several locals have bargained for a matching system where each employee contributes a dollar every month and the city or county matches it, either 1:1 or 1:2. This encourages ownership of the fitness program by both labor and management.

• Step 3

Initiate the bid process to purchase the selected equipment. If possible, small orders should be avoided because larger orders usually provide a reduced cost per unit. Requests for Proposals (RFPs) must be written specifically for the equipment that was chosen by the above process. Ideally, the same equipment is available in all work locations. When purchasing cardio equipment consider purchasing the same equipment as that used to conduct the fitness assessment.

■ Methods of Acquiring Equipment

To efficiently utilize allotted exercise time, adequate equipment and facilities for a total and balanced exercise program must be made available to uniformed personnel. Traditionally, equipment and facilities have been provided in one of the following ways: exercise equipment placed directly into each fire station; centralized fire department locations where personnel can exercise; contracted fitness center locations where personnel can exercise; use of outdoor alternative facilities such as track, high school, park or local college/university.

The following summarizes various fitness facilities models:

<u>Method of Equipment Placement</u>	<u>Results</u>	<u>Considerations</u>
Equipment in every station	<ol style="list-style-type: none"> 1. Uniformed personnel can use equipment at their convenience, between emergency calls. 2. Personnel are logistically in quarters where they are strategically located within their first due response area. 3. Different personnel can utilize equipment at varied times during the shift. 	<ol style="list-style-type: none"> 1. Initial investment in equipment is large. 2. Equipment must be maintained. 3. Number of peer trainers needed is increased; however, officers or motivated fire fighters can be trained.
Centralized fire department fitness center	<ol style="list-style-type: none"> 1. Uniformed personnel can use equipment any time. 2. Less total expense in initial purchase of equipment. 3. Peer trainers can work at fitness center, providing some expertise. 	<ol style="list-style-type: none"> 1. Crews must work out together with no option for individual needs. 2. Crews may have to leave first due which leaves certain areas with less protection. 3. Crew working out when receiving emergency calls is less likely to return to complete the workout.
Contracted fitness center	<ol style="list-style-type: none"> 1. Are usually outfitted with the most modern equipment. 2. Usually have certified exercise professionals on site. 3. Multiple pieces of equipment allows several personnel to perform the same exercises simultaneously. 4. Less initial cost for complete array of exercise equipment. 	<ol style="list-style-type: none"> 1. Crews must all workout together with no option for individual needs. 2. Crews must leave first due which leaves certain areas with less protection. 3. Crew working out when emergency call comes in is less apt to return to complete the workout. 4. Ongoing costs to fulfill contract may make option more expensive in the long term. 5. Perception by public of fire fighters “playing” instead of going on emergency calls. 6. Difficulty with listening to dispatch radios – noise can be irritating to civilian exercisers. 7. Lack of Peer Fitness Trainers.
Outdoor Facility	<ol style="list-style-type: none"> 1. Low cost 2. Readily available 3. Public 	<ol style="list-style-type: none"> 1. Inclement weather 2. Extreme hot or cold temperatures 3. Location 4. Maintenance of facility

■ Maintenance of Equipment

Equipment must be maintained as established by the equipment manufacturer. Many exercise programs have failed due to poorly maintained equipment. Poorly maintained equipment is not only less rewarding to use, it is also unsafe. Routine equipment inventory and inspections must be done so that equipment can be accounted for, maintained, repaired, and replaced when necessary. Fire department Peer Fitness Trainers should be designated to ensure that all fitness equipment is kept in good condition.

■ Types of Necessary Equipment

The following list is the suggested complement of equipment that should be available to all uniformed personnel for a complete and balanced exercise program.

• *Resistance Equipment*

Can include the following: power cage/squat rack, adjustable pulley machine, leg press/ hip sled machine, leg curl machine, adjustable bench, lat pull down/seated row machine, Olympic bar and an assortment of weights (it is recommended that there is a minimum of 300 pounds), dumbbells (it is recommended that there is a minimum of 5 pounds to 80 pounds), floor mat for abdominal and flexibility training, burst-resistant stability ball(s), medicine ball(s), and an assortment of resistance exercise bands and/or tubing.

• *Cardiovascular Equipment*

Can include the following: commercial aerobic machines such as treadmill, stationary bike, stair stepper, stepmill, elliptical cross trainer, or rowing ergometer.

EXERCISE SPECIALIST AND PEER FITNESS TRAINERS

A broad-based Fitness Committee including labor, management, a fire department physician, and an exercise specialist should be established. A exercise specialist, together with properly trained Peer Fitness Trainers, can most effectively disseminate the work of the Fitness Committee, while enhancing and guiding the fitness efforts of all uniformed personnel. It is advisable to select Peer Fitness Trainers that are demographically representative of the department.

■ Qualifications of the Exercise Specialist

The exercise specialist should be chosen with care. Ideally, the professional exercise specialist should have a degree in exercise physiology, kinesiology, or a related field. A thorough knowledge of the job of fire fighting is essential. The individual must be able to ride along, conduct job analyses, and remain current on literature pertaining to fitness and fire fighting. The individual's ability to conduct ongoing research related to personal fitness and injury is another desirable asset. In addition, excellent communication and interpersonal skills are necessary.

■ Peer Fitness Trainers

One role of the Peer Fitness Trainer (PFT) is to encourage safety and participation through their professional guidance and supervision of uniformed personnel regarding fitness issues. An integrated multi-level approach is recommended, where the exercise professional trains and oversees multiple Peer Fitness Trainers. All fire department PFTs should be certified through the IAFF/IAFC/ACE Peer Fitness Trainer certification program. All certified PFTs must maintain their certification through continuing education. In addition, they should be encouraged to supplement their professional certification with further advanced training.

Some recommended non-profit certification agencies that provide advanced training include IAFF/IAFC/American Council on Exercise (ACE) PFT Program, National Strength and Conditioning Association (NSCA), American College of Sports Medicine (ACSM), National Academy of Sports Medicine (NASM), the Canadian Society of Exercise Physiology (CSEP).

Certified PFTs have demonstrated the knowledge and skills required to design and implement fitness programs, improve the wellness and fitness of uniformed personnel, assist in the physical training of candidates, incumbents, and recruits, as well as being able to influence the broader community in achieving wellness and fitness. Peer Fitness Trainers have an understanding of proper exercise techniques for uniformed personnel and have proven that they have a broad scientific knowledge of exercise. Certification thus improves the credibility and safety of departmental fitness programs. Certified PFT's can be utilized in many ways, including: designing and supporting personalized fitness programs for uniformed personnel; educating company officers about fitness benefits; performing yearly fitness assessments of incumbent personnel; evaluating and maintaining fitness equipment; candidate mentoring and orientation; CPAT administration, proctoring and data collection; educating new hires regarding the importance of fitness throughout their fire service career and beyond; and training recruits.

INCORPORATING FITNESS THROUGHOUT THE FIRE SERVICE

■ Individual Responsibilities

The PFT should provide current information which addresses specific needs of uniformed personnel through individual fitness program design and implementation, nutrition counseling, and lifestyle coaching. Peer Fitness Trainers should conduct themselves as role models and ambassadors for this Initiative.

Individual responsibility of the PFT may include: initiating workout programs for their respective department; playing an active role in healthy meal planning for their department;

participation in special projects and committees pertaining to department fitness initiatives; commitment to the continuous educational process required to remain certified.

■ Company Officers

The company officer is the formal leader of the crew, and is responsible for their health, safety, and training. The company officer's influence on the attitudes of the crew cannot be overstated. With continuing wellness education, the officer can become a wellness agent for the department. Such education will ensure officers understand purpose, scope, and implementation of wellness programs in the fire department.

■ Recruit Training

Peer Fitness Trainers assigned to the academy can help incorporate fitness into the culture of the fire department. They should be utilized to design an exercise program based upon the physical demands and workload of the training academy environment.

Responsibilities of PFTs at the academy can include the following: overseeing and implementing the fitness program to the recruits; educating recruits on all aspects of maintaining wellness during their careers; monitoring the recruits for signs of overtraining, and adjusting training programs to prevent exercise-related injuries; designing post-academy exercise programs for the recruits and follow up with recruits throughout their probationary period; and providing a resource for the recruit training officers to improve poor performance that may be related to low levels of fitness.

■ Candidate Preparation

The Fire Service Joint Labor Management Wellness-Fitness Task Force has developed a comprehensive Candidate Physical Ability Test (CPAT) program that includes a physical ability preparation guide.¹ This program will ensure that new fire fighter candidates are more physically capable of performing the challenging job of a fire fighter, while making it possible to improve the diversity of the fire service.

FITNESS EVALUATION

All uniformed personnel shall participate in a mandatory, annual, non-punitive, and confidential fitness assessment. Medical clearance must be obtained prior to the fitness assessment. Once the fitness assessment is completed, the exercise specialist should provide feedback to uniformed personnel and the department's physician regarding the individual's physical capacity pertaining to his or her job.

The fitness evaluation and subsequent personalized feedback from the exercise specialist will include: individual's current level of fitness, comparison with previous fitness results (if available), identification of areas for possible improvement, and a suggested exercise program. All data will

be collected and stored into a confidential database to be used for future fire service research.

To ensure *maximum safety*, uniformed personnel must be screened for any medical contraindications and instructed in proper technique prior to performing any of the fitness evaluations. All department fitness assessments should be continuously evaluated to ensure that they are conducted correctly and consistently by appropriately trained department fitness personnel.

The fitness evaluation will assess five specific areas including body composition, aerobic capacity, muscular strength and power, muscular endurance, and flexibility.

This edition of the WFI contains significant revisions to the fitness assessments as a result of a comprehensive review by the members of the WFI Technical Committee. All protocols for this evaluation are referenced in Appendix A.

■ Body Composition

The need for body composition measurements is necessary for a fitness evaluation and differentiates between the relative amounts of adipose tissue (fat) and lean body mass (LBM). LBM consists of muscle, bone, organs, nervous tissue, and skin. Although some body fat is considered essential, excess body fat increases the workload and amplifies heat stress by preventing the efficient dissipation of heat when a person exercises. In addition, added body fat elevates the energy cost of weight-dependent tasks, such as climbing ladders and walking up stairs, as well as contributing to injuries and increasing the risk of many chronic diseases. Obesity is associated with an increase of many chronic diseases including cardiovascular disease, hypertension, dyslipidemia, heart failure, diabetes, several types of cancer, asthma and chronic lung diseases, obstructive sleep apnea, dementia, arthritis, and gastroesophageal reflux disease.

Obesity is defined as more than 30 percent body fat for women and more than 25 percent body fat for men. It is important to determine the amount and distribution of body fat to monitor the health risk associated with obesity.

• Evaluation of Body Composition

There are many methods of estimating body composition and include: circumferential measurements, hydrostatic weighing, BodPod, bioelectrical impedance analysis (BIA), skinfold measurements, body mass index (BMI), and dual energy x-ray absorptiometry (DEXA).

The accuracy, reliability and practicality of these methods vary. The WFI has selected skinfold measurement as a realistic method of assessing body composition. Skinfold measurement is a relatively accurate and inexpensive option, provided that the trainer is proficient with the tech-

nique. The accuracy of this estimation process depends on the PFT's ability to identify and measure the sites defined by anatomical landmarks.

The sum of the skinfold, along with the individual's age, are plotted on a regression chart to estimate the percentage of body fat. Because men and women deposit fat differently, the sites are gender specific. The regression charts used by the WFI to estimate body fat are also gender specific. The skinfold measurement will be collected at three specific sites. Men are measured at the triceps, sub-scapular and pectoral sites. Women are measured at the triceps, abdominal and suprailiac sites. It is essential that the PFT use the exact skinfold sites along with the appropriate regression chart specified in Appendix A.

■ **Aerobic Capacity**

Evaluating the aerobic capacity of participants will be conducted using a Treadmill and Stepmill.

It has been well established that the leading occupational-related diseases causing premature departures from the fire service are heart disease and lung disease. Heart disease causes 45 percent of the line-of-duty deaths that occur among U.S. fire fighters. Emergency fire fighting duties have been found to be associated with a risk of death from coronary heart disease that was markedly higher than the risk associated with non-emergency duties. Fire suppression tasks are associated with the highest risk which is approximately 10 to 100 times as high as that for non-emergency duties.¹

Aerobic fitness is fundamental to the health, safety and performance of all uniformed personnel. A program of regular aerobic exercise will reduce an individual's risk of heart and lung disease. Furthermore, such exercise will help improve cardiovascular fitness and maintain normal body composition, weight, blood pressure, blood lipids, and blood sugar. It has been estimated that inactive persons have a 90 percent increased risk of heart attack than physically active persons.²

Numerous studies have demonstrated the necessity of maintaining a high level of aerobic capacity for the duties of uniformed personnel. Measurements of heart rate response taken during normal fire fighting tasks have been at or near maximal levels.³ In addition, the oxygen uptake requirements associated with performing live fire rescue and suppression tasks fall within the range of 60-80 percent of maximum.⁴ The cardiovascular, respiratory, and thermoregulatory strain resulting from work at this high level of intensity is profound.⁵ Therefore, optimal aerobic capacity is essential to the safety and performance of uniformed personnel.

• **Evaluation of Aerobic Capacity**

Accurate estimates of MaxVO₂ are needed in order to educate uniformed personnel on their present level of fitness as it relates to the demands of their job. This information is used as a basis for a cardiovascular exercise prescription, and helps uniformed personnel gauge the effectiveness of their program. The WFI Treadmill Protocol and the WFI Stepmill Protocol were adopted by the WFI as submaximal field tests for fire service personnel. Although the first edition of the WFI allowed for several other aerobic capacity assessment protocols, these two were retained because of the inherent advantages of practicality and usefulness for our population. Unfortunately, both of these protocols were found to provide values that were somewhat variable and inconsistent with other proven measures of cardiovascular fitness. Deviation from known standards is unacceptable for two reasons: overestimation would fail to identify uniformed personnel who lack adequate aerobic fitness to meet the demands of their job. Conversely, underestimating aerobic capacity might frustrate aerobically fit uniformed personnel, which could cause them unnecessary concern. Individuals may even consider making adjustments to their exercise programs, based on inaccurate information.

In response to this problem the IAFF contracted with the University of Texas Graduate School of Health and Kinesiology. The net result was the development and validation of newly refined prediction equations for both tests, and a new protocol for the Stepmill assessment. These changes will provide uniformed personnel with a more accurate estimate of cardiovascular fitness. To avoid confusing the new protocols with previous versions, these new assessments will be referred to as the WFI Treadmill test and WFI Stepmill test.

• **Submaximal versus Maximal**

Measurements of aerobic capacity may be performed at either submaximal or maximal levels. Submaximal aerobic capacity tests, when properly validated, have been shown to accurately estimate the individual's volume of oxygen consumption. These tests are less expensive and easier to administer than maximal tests and can be performed in a fitness center setting by a qualified exercise specialist. The submaximal aerobic assessments developed for the WFI are based on the heart rate response during graded exercise. It is important to note that all submaximal tests are based on regression equations and are subject to various prediction errors including: variance in determining target heart rate, heart rate fluctuations due to dehydration, anxiety, and medications. The magnitude and frequency of these prediction errors are reduced by using a well-validated submaximal test and appropriate medical prescreening.

For those departments electing to use maximal aerobic capacity tests, such testing must only be done by qualified

medical personnel under the supervision of a physician. Testing must be conducted in a medical setting with ECG monitoring, resuscitation and defibrillation equipment on site.

■ Muscular Strength

Strength is defined as the maximal force that a specific muscle or group of muscles can generate. The demands of uniformed personnel require above-average strength. Job task analyses have shown that the weight of equipment used by a single fire fighter on the job is in excess of 100 pounds.^{6,7} Insufficient muscular strength may contribute to higher incidence of sprains, strains and back injuries among uniformed personnel. Muscular strength will be evaluated using the hand dynamometer, arm dynamometer, leg dynamometer and the vertical jump power test, which is optional.

• Evaluation of Muscular Strength

Strength measurements are specific to the joint and range of motion that is being measured. Since uniformed personnel require general strength throughout the body for safe and efficient job performance, a representative sample from three commonly used muscle groups was selected for purposes of this evaluation.

The WFI Technical Committee fielded concern about the static leg strength assessment and its potential for injury, particularly for individuals with a history of lumbar problems. Following an extensive review by the WFI Technical Committee, it was determined that the test is safe for our population, provided that comprehensive pre-screening, instruction, supervision and adherence to proper technique are followed. In fact, the opportunity to educate participants on proper lifting form during this assessment has contributed to its value. The committee also recognizes that some apprehension may still exist. Therefore, a vertical jump test may be offered as an option. It should be noted that the results of the vertical jump are not directly comparable to the results of the static leg strength assessment. The static assessment evaluates muscular *strength*. The vertical jump evaluates leg *power* by estimating the rate of force produced by the legs and hips in propelling the body vertically.

• Methods to Safely Assess Strength

For safety and data collection purposes, strength measurements will be conducted using static handgrip, leg and arm dynamometer measures, or the optional vertical jump assessment. These tests have been determined to be safe, valid, and reliable methods for evaluating muscular strength and/or power. In order to measure maximal strength or power, the individual must execute a maximal muscular contraction. To insure the highest degree of safety, evaluators must provide appropriate pre-screening, provide detailed instructions, and emphasize performance technique.

Grip Strength — Grip strength has been shown to be a key factor in many essential emergency service tasks including lifting and carrying equipment, packaging and moving patients, holding and operating hose lines, raising extension ladders, and removing victims.

Grip strength will be measured using a hand grip dynamometer, please refer to Appendix A for hand grip protocol.

Leg Strength and Power — Leg strength is required for many essential emergency service tasks including lifting and carrying equipment, forcing entry, climbing and negotiating ladders and stairs, pulling and operating hose lines, and lifting patients.

Leg strength will be assessed using a leg dynamometer; please refer to Appendix A for the static leg strength protocol.

Leg power will be measured using the optional vertical jump timing mat; please refer to Appendix A for the leg power protocol.

Arm Strength — Arm strength is imperative for the performance of many standard and essential fire and emergency tasks including stabilizing, lifting, and carrying tools and equipment, operating hand lines, and victim transport.

Arm strength will be measured using a dynamometer, please refer to Appendix A for the arm strength protocol.

■ Muscular Endurance

Muscular endurance is the ability of a muscle group to perform repeated contractions or to sustain a contraction over time. Job analyses have shown a strong correlation between muscular endurance and the essential job tasks of uniformed personnel.^{8,9} Insufficient muscular endurance may precipitate many preventable injuries. Core muscle endurance is necessary to stabilize the torso and provide lower back support during exertion. Well-conditioned core muscles will have the necessary endurance to stabilize the spine and support the lower back during sustained activity. Weak core muscles may contribute to lower back pain and injury. Muscular endurance will be evaluated using static plank, push-ups or alternate grip push-up.

• Evaluation of Muscular Endurance

The muscular endurance evaluation has been modified. The push-up assessment, or alternate grip push-up, may be used to evaluate upper body muscular endurance. The alternate grip push-up was added for individuals with a history of hand, wrist or shoulder injuries. Either push-up protocol can be used to evaluate muscular endurance of the chest or the triceps, please refer to Appendix A for push-up protocol.

The modified curl-up protocol has been eliminated in favor of the static plank evaluation. This change was a result of extensive research by the WFI Technical Committee to ensure the safety of the individual and to improve the specificity of the evaluation. The Technical Committee shared concerns that the fixed-foot curl-up produced unnecessary sheering forces on the lumbar spine. To address this concern, the static plank will now be used to evaluate muscular endurance of core muscles in the trunk region. This incorporates muscular stabilization which better simulates the action of the core muscles in daily activity, and it is a sound training technique. These factors make it a safer and more specific assessment. Please refer to Appendix A for static plank protocol.

■ Flexibility

Flexibility is the ability of a joint to move through a full range of motion. The effect of flexibility on performance is inconclusive, however it is widely accepted that a lack of flexibility in certain joints will likely increase the risk of injury. Joint and limb restrictions may influence essential dynamic movements, balance, coordination, and muscular work efficiency. When a joint lacks flexibility, that specific joint is unable to achieve its full normal range of motion. Surrounding joints must then overcompensate to perform essential tasks. This biomechanical compromise produces a “microtrauma,” or an overuse injury over the long term.

The leading types of line-of-duty injury within the professional fire service are sprains and strains. In addition, the most prevalent injury leading to premature retirement from the fire service is back injury. Insufficient flexibility may contribute to the cause of these statistics.

Many uniformed personnel report some medical history of lower back pain. In a survey conducted by the Miami Dade County Fire Rescue Department, 55 percent of their members reported current lower back pain and 86 percent of the members reported a past medical history of lower back pain. Therefore, it is critical that assessment procedures do not exacerbate symptoms of existing back pain or cause further injury.

Flexibility will be evaluated through a modified sit and reach assessment.

• Evaluation of Flexibility

The modified sit and reach assessment evaluates general flexibility of the posterior muscles of the trunk and legs, as described in Appendix A.

■ Data Collection

The data collected from the fitness assessments will identify the following: body composition, aerobic capacity, flexibility, muscular strength, muscular power, and muscular endurance of all uniformed personnel; changes in fitness

levels of personnel over the course of their careers; effectiveness of the medical and fitness program in improving individual personnel’s physical fitness; muscular weaknesses and imbalances that may increase the risk of injury; possible causes of sprains and strains; possible risk factors for back injury; possible factors related to the high incidence of musculoskeletal injuries in the fire service.

■ The WFI is not a Standard — Norms vs Standards

A *norm* is an informal guideline derived from the average or median performance of a large group. A *standard* is a definite rule, principle, formal guideline, or measure established by an authority. Norms are often used in the fitness setting as a frame of reference to assist with the interpretation of personalized results, such as assisting individuals in understanding how their results compare to a population of similar age and gender. While fire departments may provide information regarding norms for their members, *under no circumstances* does the IAFF/IAFC Joint Labor Management WFI Task Force Committee endorse the use of norms to establish a standard that might result in punitive action. All uniformed personnel should understand that the goal of this evaluation is solely to improve personal fitness. By intent, this Initiative has set no standards for any of these areas. Every individual is expected to attain or maintain physical fitness through a personalized exercise program, as well as a healthy lifestyle.

EXERCISE PROGRAMS

The development of an exercise program based on the specific needs of each individual is a major component of the Wellness-Fitness Initiative. The exercise program should be a progressive plan that accounts for and meets the needs of an individual’s current level of fitness, job duties, time restrictions, physical capabilities, nutritional status, and self-improvement efforts. Although the specifics to designing exercise programs are beyond the scope of this document, it is important to mention a few considerations.

■ Considerations for Designing Exercise Programs

The benefits of personalized fitness programs cannot be overstated and the customer service aspect of exercise programming is critical. The fitness assessment previously described is only the first step in educating uniformed personnel regarding their level of fitness and guiding them through the process of establishing specific personal goals. Assessments must be followed by a one-on-one consultation in which the individual can address concerns and learn about recommended exercises and equipment use.

Personalized exercise programs should consider the following individual characteristics: age, weight, motivation level, goals, current aerobic and anaerobic capacity, current strength level, overall fitness level, exercise experience, physical work requirements, muscle imbalances, personal lifestyle, time constraints, equipment available, preferred

activities and mode of exercise, and sociological preference (individual vs. group).

In addition, the program should focus on encouraging positive choices, including changes in nutrition, time management, and health priorities. The program should also be balanced to include each of the following fitness components: cardiovascular capacity, flexibility, muscular strength, muscular power and endurance, and body composition

In some cases, exercise programs centering on job task performance may be appropriate.

Training is a form of stress. The body will adapt and respond as long as the stress is not too great. All training programs should be progressive in nature. Caution should be used providing time for the body to recover. Programs that proceed too quickly will over-stress the body and may lead to injury. Job specific allowances must be made to allow for sleep deprivation, high stress shifts, and intense workload that include working fires, long incidents, heavy rescues, or high volume of calls.

NUTRITION

Few lifestyle factors have as strong of an influence on an individual's overall health and physical performance as his or her habitual eating pattern. The working environment of uniformed personnel presents unique challenges to the maintenance of healthy eating habits. Proper nutrition enhances the performance and quality of life of uniformed personnel.

■ Nutrition for Performance

Nutrition plays a significant role in exercise performance and recovery. Some benefits of a well balanced diet include: optimal energy delivery, enhanced recovery, and strengthened immune function.

Obesity increases an individual's risk for injury, reduces performance, and adversely affects the ability to dissipate heat while working. A well balanced diet, combined with a consistent exercise program, is the most reliable method to reduce body fat.

■ Nutrition for Health

The high levels of stress, physical demands, long term exposures to chemicals and disease, and poor nutritional habits have contributed to elevated risks of heart disease and cancer within the fire service.

• Heart disease

Several risk factors for heart disease including high cholesterol, obesity, hypertension, and diabetes can be reduced by dietary intervention. A diet low in total fats, saturated fats, cholesterol and salt, but high in fruits, vegetables, and fiber has been shown to reduce the risk of heart disease.

• Cancer

Diet has been shown to be a pre-disposing factor in the development of cancer. A diet high in animal fats, and obesity in general, have been linked to the development and recurrence of colorectal, breast and prostate cancer. A diet high in fruits, vegetables, and high fiber whole grains has been shown to have a protective effect against cancer.

■ A Balanced Diet

A nutritionally sound diet fuels the body for exercise, strenuous work, and resistance to disease. Paramount to the success of a departmental wellness program is the reinforcement of healthy dietary habits. By educating company officers and making them a part of the wellness program, healthy eating should become an expectation within the fire station.

Most experts agree that a balanced and varied diet can meet all of the required daily nutritional needs. The exact quantity of protein, fats, and carbohydrates has long been subject for debate. The widely accepted contribution to the total daily caloric intake is as follows: carbohydrates should be 55-65 percent; proteins consist of 12-20 percent; and fats should be 25-30 percent of the total daily intake.

In addition, the following USDA guidelines will help lead to a healthy diet: eat five or more servings of fruits and vegetables; reduce the amount of cholesterol, salt, and fats, particularly saturated fat; replace high fat meats with lean cuts; reduce the amount of processed foods, which are high in salt and hydrogenated oils; increase the amount of fiber; and drink plenty of non-caffeinated and alcohol-free beverages.

Planning for the availability of a variety of quality foods can reduce the potential for unhealthy eating behaviors.

■ Nutritional Counseling

A nutritional counselor, dietitian, or sports nutritionist is a valuable asset to any wellness program. The field of nutrition is plagued with fads and misinformation. Members, company officers, and Peer Fitness Trainers may wish to consult a qualified nutritionist. Such experts can be hired, contracted, or involved as volunteers. Benefits of a qualified nutritional expert include: development of weight loss management programs; analysis of individual dietary logs; custom nutritional programs for specific conditions such as pregnancy, weight gain, or illness; education of Peer Fitness Trainers, company officers, members, and recruits; discouragement of potentially harmful dietary practices; and development of specialized menus for post-incident replenishment.

■ Hydration

Research has shown that working fire fighters can lose more than 2.6 liters of body fluid per hour. Sweat loss in excess of 2 percent of body weight significantly impairs en-

duration capacity, elevates body temperature and decreases cardiac output. It is critical to address proper hydration throughout the shift and during rehabilitation.

During prolonged work, as the body loses water via perspiration and respiration, there is a tendency for a gradual decrease in stroke volume and the body's cooling capacity. This produces an elevated heart rate response and the accumulation of body heat. These effects amplify the sense of exertion and accelerate the rate of fatigue. Dehydration and hyperthermia further predispose an individual to arrhythmias, myocardial infarction, loss of consciousness, stroke, and sudden death. Adequate hydration helps prevent these ill effects, making it easier to sustain physical performance and enhance recovery. Uniformed personnel can improve their efficiency and capacity for evaporative cooling (sweating) through the following means: maintaining a high level of fitness; acclimatizing the body to working in a hot environment, decreasing body fat; and attaining and maintaining the highest level of hydration possible.

SUMMARY

In summary, this document has provided a model for proper implementation of fitness programs in the fire service. A preponderance of research has shown the critical need for high levels of aerobic fitness, muscular endurance, muscular strength, power, flexibility, and body composition to perform safely and effectively on the fire ground. Adequate physical fitness is essential in maintaining the wellness of our uniformed personnel. Fitness must be incorporated into the overall fire service philosophy.

While assessing uniformed personnel's current fitness level is an important part of developing an individualized fitness program, assessment is not, in itself, a fitness program. An effective physical fitness program has several components that must be implemented. The component elements necessary for a successful and comprehensive physical fitness program have been highlighted throughout this chapter. Appropriate protocols are referenced in Appendix A.

ENDNOTES

- ¹ New England Journal of Medicine Volume 356; Number 12; Page 1207; March 22, 2007
- ² Powell KE, Thompson PD, Caspersen CJ, Kendrick JS: Physical Activity and the Incidence of Coronary Artery Disease. *Ann Rev Pub Health* 1987; 8:253-287.
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CHAPTER 4 — Injury and Medical Rehabilitation

Management and Labor shall work together to provide a progressive individualized injury/ fitness/medical rehabilitation program that shall ensure full rehabilitation of any affected uniformed personnel to a safe return to duty status.

This chapter highlights the following:

- Definition of Rehabilitation
- The Need for Rehabilitation
- Criteria for Successful Rehabilitation
- Clinical Services
- Transitional Duty
- Injury Prevention Program

DEFINITION OF REHABILITATION

Rehabilitation is the sequence of clinical services that maximizes a patient's physical function and wellness following an injury or illness. Rehabilitation involves the clinical services of physicians, physical or occupational therapists, exercise physiologists, Peer Fitness Trainers, and nurses. Rehabilitative care starts at the movement of injury and is a continuum of services to restore the patient to maximum medical improvement.

The successful rehabilitation of injured uniformed personnel, regardless of the cause or nature of the injury, must address both physical and psychological factors which impact the recovery process. Anticipating and addressing psychological needs, particularly the stress associated with physical injuries (e.g., pain, physical inactivity), medical treatment (e.g., medical uncertainty, seriousness of the injury), rehabilitation difficulties (e.g., slow progress, rehabilitation outside of the fire fighter community), financial difficulties, career worries, and the sense of missed opportunities can speed the return-to-work process. Moreover, the psychological skills acquired in rehabilitation can reduce the attention disruption and increased muscle tension which drives the stress-injury relationship.

THE NEED FOR REHABILITATION

Every year, statistics show that fire fighting is one of the most dangerous occupations in the world. In some departments, medical disability from on the job injuries and illnesses accounts for over 50 percent of retirements. According to the NFPA 2006 Fire Fighter Injury Report the onset of strain, sprain, and muscular pain accounted for more than 50 percent of total injuries. This report estimates that there were 83,400 fire fighter injuries in the line of duty. This is an increase of 4.1 percent from the previous year compared to data compiled for private industry by the United States Bureau of Labor Statistics which shows a decrease in the rate of injury for workers in private industry.

The rehabilitation of our uniformed personnel must be a priority. The cost of one worker lost due to a preventable injury or illness is at least equivalent to two to four times their impacted salary. When personnel reinjure themselves after inadequate rehabilitation, the costs are even higher. The cost can include the mental anguish suffered by the personnel and his or her family, as well as doubt regarding the administration's commitment to personnel health and well being.

CRITERIA FOR A SUCCESSFUL REHABILITATION PROGRAM

Rehabilitation programs can be in-house or out-sourced. Regardless of the type of rehabilitation program that is chosen several criteria must be met, including: a fire department physician that is familiar with job requirements and fit-for-duty expectations, as well as current treatment methods for the most frequent job related injury or illness for uniformed personnel; all clinicians must be familiar with fire service job requirements and fit-for-duty expectations; a transitional duty program; periodic re-evaluation prior to returning to full duty; a personalized exercise prescription that considers job requirements and the individual's past medical history; and a comprehensive injury prevention program.

■ Comprehensive Program

Rehabilitation programs must not be punitive in nature. Moreover, the program should be comprehensive in scope to include: medical treatment; fitness training; physical and occupational therapy; behavioral therapy; and psychological support services.

■ Thorough Rehabilitation

The fire department must take the lead in ensuring that uniformed personnel are properly rehabilitated prior to returning to full duty. Informed decisions should be made by clinicians familiar with fire fighting job requirements in regard to the functional capacities of uniformed personnel after significant injuries or illnesses. In short, the fire department must control the process and provide the necessary input to drive this process, and labor must support the rehabilitation process from beginning to end.

Uniformed personnel on extended leave status from normal duties for a continuous period of three months must undergo a fitness evaluation. At six months or more uniformed personnel must undergo a medical and fitness evaluation upon release by their treating clinicians prior to

returning to full duty. Extended leave status includes alternate assignment, leave of absence, and leave due to illness, injury, maternity, or other qualifying situation. Such a policy will help identify loss of conditioning which may put uniformed personnel at risk for future injuries. The department physician or designated clinician shall evaluate individual for recommendation on re-entry into the workforce. See Chapter 2 for fire department physician guidelines.

CLINICAL SERVICES

■ Qualifications for Selection

The clinician (physical therapist or occupational therapist(s), nurse and physician) used by the department should be chosen with care by the labor management wellness committee. A thorough knowledge of the various jobs within the specific fire department is required. It is highly recommended that these professionals participate in a ride along, review job analyses, and remain current in literature pertaining to fitness and the fire service. In addition, excellent communication skills are essential.

The anticipation of and screening for poor psychological adjustment to injury is critical from the beginning of rehabilitation process. Although uniformed personnel will experience higher levels of stress following injury due to the temporary and long-term impacts of an injury upon their career in a public safety setting, some individuals may require assistance with respect to psychological coping skills (e.g., goal setting, positive self-talk, imagery visualization, relaxation training) or other techniques which foster successful rehabilitation.

■ Job Specific Approach to Rehabilitation

The clinician should use an “industrial athlete” approach to rehabilitation and reconditioning. Functional strength components, as well as simulated job specific tasks, should be incorporated into individual rehabilitation programs. In addition, the clinician should be available to the department’s exercise specialist or Peer Fitness Trainers to continue any necessary conditioning programs to prevent re-injuries.

■ Clinical Pathway Rehabilitation

Rehabilitation should start as soon as appropriate when the member becomes injured or ill. When appropriate, job oriented task performance training should be included in the rehabilitation process. Rehabilitation programs should be guided by standardized approaches to clinical treatment, or clinical pathway templates. This will ensure consistent state of the art therapy and help control costs. Clinical pathways should be modified based on the specific needs of the individual and specific job requirements.

■ Basis for Clinical Pathways

The clinician used by the department must follow clinical pathways appropriate to the uniformed personnel popu-

lation. Clinical pathways should be age, gender, and position specific. They should indicate when alternate duty is advised and what tasks that duty may include. Clinical pathways should state when periodic reevaluation is indicated after the individual returns to duty. The use of clinical pathways will allow the department to optimize treatment and minimize disability and time lost from work. Also, clinical pathways should be incorporated into defined research protocols to permit long-term analysis of the clinical and administrative effectiveness of these pathways.

TRANSITIONAL DUTY

A transitional duty program must be designed to utilize the skills of injured or ill uniformed personnel during rehabilitation. It is a means to reduce injury costs and to keep the injured individual involved with the department while utilizing that individual’s expertise. Transitional duty also can be made available for non-job related injuries and illnesses. During a transitional duty assignment, the individual should be assigned to a Peer Fitness Trainer and placed on an appropriate MANDATORY rehabilitation and fitness program with the coordination of the fire department physician or designated clinician. The rehabilitation and fitness program should be conducted while on duty whenever possible as determined by the clinician.

■ Period Re-Evaluation

Once an individual returns to work, periodic reevaluation may be necessary at the discretion of the fire department physician or designated clinician. Established clinical pathways should provide guidance on the frequency of reevaluations. During reevaluation, the individual can be educated about the importance of a consistent fitness program.

INJURY PREVENTION PROGRAM

Injury prevention is a critical mission. IAFF Death and Injury Survey statistics indicate that one out of every five fire fighters will die or be injured in the line of duty in a given year. These numbers are as unacceptable for the fire service as they would be for the general workforce.

Uniformed personnel wear heavy and restrictive clothing, carry heavy and awkward equipment, enter buildings under demolition, contend with smoky and hot environments, provide rescue in hostile or dangerous locations, and often work with limited or obscured visibility. The environment is uncontrollable and often unpredictable. Yet, certain things are controllable and definitely predictable. When unfit, unwell, and untrained personnel report to work, it is predictable they will be injured.

A proactive injury prevention approach must be implemented to reduce risks in the fire service and improve personnel resistance to injuries. This proactive injury prevention program should include the following: a comprehensive and effective wellness program; a physical fit-

ness program; a strong commitment to safety from both labor and management; a designated safety officer or infection control officer; an ergonomic analysis of all aspects of the job to look for ways to rehabilitate the worker and redesign the work environment; an educational component that begins in the fire academy and continues throughout the entire career; a recognition system for personnel who practice and preach safety; establish a relationship between labor, management, and risk management; and integrate and participate in a near miss program.

■ Injury Prevention Committee

A comprehensive injury prevention program requires a labor-management committee, as an extension of the safety committee, with various experts serving as members. The committee should consist of equal members from the fire department and the union. The injury prevention committee also may wish to consult with the department's physician, an industrial hygienist, biomechanical engineer, and physical or occupational therapist. Other members may include a representative from a nearby academic school of sports medicine and an independent kinesiologist. ■

CHAPTER 5 — Behavioral Health

Management and Labor shall support the provision of a behavioral health plan, which may be delivered either through internal or external sources, based on specific elements.

This chapter highlights the following:

- Introduction
- Qualifications of the Behavioral Health Specialist
- Periodic Behavioral Health Evaluation
- Comprehensive Counseling Services
- Incentive to Access Services
- Behavioral Modification
- Employee/Member Assistance Program
- Substance Abuse
- Stress
- Marketing and Awareness of Program
- Summary
- End Notes

INTRODUCTION

■ Behavioral Fitness

Wellness is defined as a balance between the various fitness modalities — medical, physical, emotional and behavioral — and when necessary utilizing intervention and rehabilitation. Investing in the individual, the fire service's greatest resource is an investment in the capability to provide high quality service to communities while enhancing the quality of life of those individuals who serve. The behavioral health component can only be effective if it is utilized by both the department and the individual. The most successful programs have proven to be a cooperative effort between labor, management and the individual.

Physical fitness is a balance between good health, strength, fitness and durability. In contrast, behavioral fitness involves a person's thoughts, feelings and behavior. Striking a balance between physical and behavioral fitness provides individuals with mechanisms to cope with the daily rigors and extreme stressors that occur as a function of work, home and community. Daily practice and the ability to balance physical and behavioral fitness are key to an overall program of wellness, as a way to achieve maximal body and mind fitness.

Traditionally, medical and physical fitness take precedence over emotional or behavioral fitness in the fire service. However, it is clear from the aftermath of 9/11, Hurricane Katrina, and other disasters that priorities are now changing because of the shift in the profession. Exponentially fire fighters are being called upon to assist in the most disturbing and devastating times in people's lives including the death of a child, homicide, suicide, rape, child abuse, family violence, multi-fatality incidents, natural disasters,

and acts of terrorism. With each passing year, research shows that fire fighters who are able to balance physical, behavioral and emotional fitness are better equipped to deal and cope with life's adjustments, including career satisfaction, family well-being and retirement.

No wellness program is complete without addressing the behavioral well being of those involved. The behavioral health of uniformed personnel is every bit as important as their physical health. Yet, historically it has been largely ignored or taken for granted with few departments' having a comprehensive behavioral health program. Little attention has been paid to the behavioral health of fire service members until recently with the advent of Employee Assistance Programs (EAP) and Critical Incident Stress Management (CISM). Having uniformed personnel who are mentally and emotionally fit is an essential building block for the fire service's foundation. The behavioral health component of this Initiative provides important tools to assist all uniformed personnel in achieving total wellness. The services that are available through a behavioral health program must ensure the confidentiality and privacy of uniformed personnel both in writing and in practice.

In order to maintain a high level of job performance, our uniformed personnel must be able to cope effectively and balance the emotional, physical, and mental stresses of work and personal life. If the ability to cope becomes compromised, these stresses may act to unbalance his or her mental and emotional health. Alcoholism, drug addiction, the death of a co-worker, financial distress, marital and family problems, and occupational stress may be affecting the individual both on and off the job, which can further affect the individual's overall wellness if underlying issues are not addressed.

■ Investment

Although much attention is given to the investment of fire service equipment, greater focus must be given to the individuals who operate the equipment. Furthermore, in order to create the best possible workforce the necessary attention must also be given to the families and support networks of uniformed personnel. A truly comprehensive wellness program must provide continual information, education, support, access to resources that uniformed personnel, as well as their support network can access directly.

The investment and benefit in a comprehensive behavioral health component is measurable in more than financial

terms. One study found that, 60 to 80 percent of individuals who utilized counseling services through an EAP returned to fully productive status in the workplace.¹ Without attention to and an investment in programs that addresses the mental and emotional health of our uniformed personnel, the reality is a workplace where individuals are absent more often, involved in more accidents, receive more injuries, utilize more sickness benefits, and poorly perform required duties. In such a scenario, uniformed personnel are no longer an asset to the department, but rather a liability. In a profession that requires the utmost skill and reliability, an emotionally, physically, or medically unfit member may jeopardize not only the safety of themselves, but that of their co-workers.

On a departmental level, having a strong behavioral health component as a part of a wellness program will enhance daily operations as well as personnel satisfaction. A behavioral health component addresses issues a troubled employee faces, but can also serve an important function in promoting proactive health programs. Promoting proactive health programs includes providing educational seminars and distributing a variety of materials on topics that are of interest to uniformed personnel and their families. Some issues that can be addressed through behavioral health program include positive versus destructive coping strategies, shift work and sleep disturbances, balancing the stressors of emergency services work and families, weight control, nutrition, cholesterol control, tobacco use cessation, fitness, hypertension awareness, preventive medicine, infection control, substance abuse, retirement planning, career/vocational guidance, job associated grief counseling, and other specific work related issues.

■ Balance

Having the ability to maintain a balance minimizes the physical and behavioral risks for uniformed personnel and is a key factor to the physical demands of the profession. Uniformed personnel work one or two days on the job followed by several days off, having such a balance allows uniformed personnel to rest and recharge so that they can bring their best physical self to their important job of protecting the public. When the physical balance is disrupted the onset of fatigue, negative moods, error and injuries can occur. The importance of maintaining physical balance and strength to be effective is undisputed within the profession.

Balance is also a key factor for behavioral health. When behaviors, moods, thoughts and emotions are not in balance, a high-risk situation for uniformed personnel can occur. Unhealthy or aggressive behaviors, negative moods, thoughts and emotions can disrupt the balance of effective functioning both in life and on the job. The ability to maintain balance in behavioral health is critical to uniformed personnel because the mind and body are not separate entities, but are interwoven and connected. The

combination of mind and body produce the whole person just as hydrogen and oxygen combine together to produce the fire fighter's most effective tool — water.

■ Resiliency

Uniformed personnel are increasingly faced with events that are catastrophic, including terrorism, natural and manmade disasters. Two people who experience the same traumatic event can have very different reactions to it, which impacts the after effects an individual may experience. Increasingly, there is research that focuses on the adapting mechanisms people have when faced with trauma or catastrophic events, the emerging theory is known as Resiliency Theory. The concept of resilience is the process by which individual's adapt to the event, as well as their available network in order to effectively function after a catastrophic event occurs.²

A fire chaplain trained in Pastoral Counseling explains that individuals who have a traumatic experience must "attach meaning to what happened — not necessarily control, but meaning."³ The ability to gain from and integrate the experience creates a sense of meaning and provides individuals with the ability to be resilient to and accepting of the "new normal" their lives undergo after such an event.^{iv} There are some key factors that contribute to resiliency and include having caring and supportive relationships that exist within the family structure, as well as externally, a realistic plan and a plan of action in order to deal with the event, lastly having a positive sense of spirituality.

QUALIFICATIONS OF THE BEHAVIORAL HEALTH SPECIALIST

Individual fire departments should hire or contract with a behavioral health specialist to coordinate and oversee the behavioral health of its uniformed personnel. Ideally, the behavior health specialist should be a licensed mental health professional with a Ph.D. or Master's degree in the field of psychology or a related and relevant field, which can include social work, nursing, counseling, mental health counseling, or training and certification as a physician who specializes in psychiatry. Regardless, it is essential that the behavioral health specialist is familiar with the unique stressors and psychosocial elements of uniformed personnel in order to address the needs of the individual who is seeking or needing assistance.

Essential professional training for a behavioral health specialist should include: Critical Incident Stress Management (CISM), with required Individual Crisis Intervention and Peer Support, Group Crisis Intervention and preferred Advanced CISM; crisis intervention; general stress; group processes; human communication skills; direct intervention strategies; Post Traumatic Stress Disorder (PTSD); and being familiar with the environments of uniformed personnel through ridealongs. Training considered to be

beneficial for the behavioral health specialist includes: substance abuse; alcoholism; family therapy and physiological bases of behavior. Moreover, the behavioral health specialist should be charged with developing and coordinating the department's program in order to maximize its effectiveness for uniformed personnel.

Because a behavioral health program deals with sensitive issues it is imperative that the behavior health specialist takes every precaution to ensure the confidentiality of the uniformed personnel and must be a cornerstone of the fire department's program. If uniformed personnel are not assured and do not trust that their participation in the behavioral health program will be kept confidential, they will not utilize it.

PERIODIC BEHAVIORAL HEALTH EVALUATION

As a part of the annual medical examination, a confidential behavioral health evaluation should be included for all uniformed personnel. The confidential behavioral health evaluation should include questions that address: dealing with stress; alcohol use; financial and family problems; substance abuse; departmental problems; weight management; tobacco abuse; and assistance with any of these problems for an immediate family member. The department's behavioral health specialist should review each survey, and then meet with individually with each participant to review their survey and offer specific counseling for identified problems. The behavior health specialist working with the individual should develop a course of action that will best address the issue(s) with the goal of achieving a well-balanced individual.

COMPREHENSIVE COUNSELING SERVICES

The department's behavioral health specialist should be responsible for providing direct counseling and when necessary promptly referring an individual to behavioral health care services such as, but not limited to: outpatient counseling; assessing potential high risk addictive behavior and counseling; substance abuse outpatient treatment; inpatient chemical dependency treatment; including detoxification; psychiatric evaluation and treatment; inpatient behavioral counseling and suicide prevention; financial counseling and/or debt consolidation; tobacco use cessation classes and critical incident stress management counseling.

In some instances, these services are available through an Employee Assistance Program (EAP). However in other cases, professional assistance from contracted agencies and/or through the individual's health plan might become necessary. The behavioral health specialist should oversee the coordination of any such arrangements. Behavioral health assistance, treatment and therapy should be provided through the individual's health insurance plan or through the department's EAP, just as medical treatment and physical rehabilitation are provided. If necessary, leave

time should be handled in the same manner as it would be with any medical problem or issue.

Counseling services can help promote a well balanced life to uniformed personnel on a wide variety of issues. Having resources and a program available to uniformed personnel will help to establish a holistic approach to establishing and maintaining a healthy mind-body connection, which will assist in having a well-balanced, high-performing individual in the work place. Having access to comprehensive counseling services is an integral part of the Wellness-Fitness Initiative, as well as many of the performance-based issues that exist in the fire service.

Following referrals by the behavior health specialist and the use of behavior health services for intervention, if structured aftercare is necessary it should be made available to the individual. Including a comprehensive follow-up and periodic maintenance visits is essential and should also be provided to both the individual and their families. A department's behavioral health program should also have access to a wide variety of 24-hour help sources.

■ Chaplain Services for Spiritual Needs

Fire department chaplains may provide valuable guidance to those individuals who may be in need of emotional or spiritual support. Chaplains should be able to address issues using a non-denominational approach and direct persons to any necessary assistance. Chaplains must be able to recognize signs of stress and implement effective methods to help uniformed personnel cope with daily and life pressures. Chaplains should have training in current CISM methods and death notifications. A local clergy person can be appointed as fire department chaplain to handle emergency situations within the fire department, such as: serious injury to fire department members; line of duty deaths; notification of family members for serious injuries or fatalities; suicides involving fire department members and their families; visitation to injured personnel and counseling.

Some important functions of the fire department chaplain are to assist fire service personnel and their families in times of crisis, and, to help them with their spiritual needs. The chaplain can serve as a spiritual liaison with an individual's minister in addressing job stresses. The chaplain may comfort the bereaved and offer positive direction to victims' families. The services of a chaplain can greatly enhance an individual's or family's emotional response to a particular incident.²⁰

■ Financial Issues

An individual who keeps their financial life in good order or "fit" can reap many benefits for themselves and their family. The core exercise for financial fitness is saving which can prove to be challenging when trying to meet all other financial obligations. Obviously it is necessary to

spend money on the essentials for life — housing, food, transportation, education, insurance and medical care and recreation, for mental and behavioral health, but savings can provide both emotional and financial security. Having resources available to uniformed personnel on financial issues is another tool that will help in creating and maintaining a healthy balanced life.

There are some essential components to eliminating financial stresses including savings, managing debt and planning for college costs. Saving a portion of your income is key to financial health because it allows you to cover both foreseen and unforeseen costs and will help position individual's for a comfortable retirement. Planning for the cost of college, whether children are heading to college in a few years or in 18 years, there are steps that can be taken to help cover the considerable costs, including: tax free savings such as 529 Plans and Coverdell Education Savings Accounts (CESAs).

■ Retirement Planning

Retirement is one of the most significant milestones or passages in life. Retiring from the fire department can alter an individual's life in countless ways. Retirement most obviously affects finances and time, but it can also change how an individual sees themselves, their social network and friendships, motivation, self-esteem and overall happiness and well-being. Being able to chart a course for retirement will make all the difference in whether the changes that come with retirement will be financially comfortable and emotionally satisfying or a constant struggle.

Making uniformed personnel aware of the changes that come with retirement is essential to ensuring a smooth transition. It is important to plan for post-retirement activities, which do not have to involve work, so that individuals can deal with the significant changes that come with retirement and are not caught off guard. Having other uniformed personnel who have retired can be a benefit so individuals can learn about the pleasures and pitfalls of retirement.

■ Marriage and Health

The marital relationship is the foundation of one's family life and for good reason. A three year study conducted by the Center's for Disease Control on 127,545 adults found that married adults are happier, healthier and wealthier than unmarried adults (Schoenborn, 2004). However, recent studies show that the quality of the marriage, not just marriage itself, is important. Good marriages reap many benefits beyond emotional harmony, but the opposite is also true - bad marriages can have far-reaching negative effects on an individual's life. Research has shown that bad marriages can affect the body's immune functioning and slow down the body's ability to heal from physical wounds and disease.

Children and youth who are raised by parents in healthy marriages compared to those raised in unhealthy marriages are:⁵ physically healthier; emotionally healthier; more likely to succeed academically; less likely to demonstrate behavior problems in school; less likely to abuse drugs or alcohol; less likely to show delinquent behaviors; less likely to become pregnant as a teenager; less likely to get someone pregnant; and more likely to attend college.

Having services available if any uniformed personnel who want to improve their marriage and reap the benefits of a good marriage are an essential component of this Initiative.

■ Communication Skills

All uniformed personnel have a variety of relationships and can include family, friends and co-workers, and are generally the center of their emotional and social life. A key to making relationships work for individuals, rather than against them, is communication. Communication can be very complex and goes beyond only using words, but utilizes silence, body language and actions. Generally, when individuals are relating with other people it commonly involves communicating and speaking with others. Becoming an effective communicator will help establish self-confidence and continue to further promote the concept of a well-balanced individual.

There are some basics to good communication, whether in the workplace or at home and should include three aspects, honesty, listening and humor.⁶ Honesty includes the ability to speak honestly about personal issues, concerns, plans and hopes. Honesty builds trust and trust promotes good communication. Listening is effective because good communicators do not just talk, they also listen. Simply listening communicates to others a level of interest in what they have to say. Communicating involves listening to others and demonstrating an understanding of what they have said. Listening to others is one of the most powerful communication tools available. Humor, is healthy both physically and emotionally and is an effective way to put people at ease, reduce tension and fear. However, like any powerful tool, humor should not be used negatively or disparaging to others, which can cause pain.

INCENTIVE TO ACCESS SERVICES

Employees should be permitted to utilize medical leave or alternate duty in order to access behavioral health services, this policy should be consistent with leave or alternate duty for medical issues. By ensuring that uniformed personnel are able to use medical leave or alternate duty will make certain they receive timely access to treatment when necessary and appropriate.

Supervisors must be instructed in methods of referring employees to behavioral health services and the contracted specialist that are consistent with each department's poli-

cies. Supervisors must have the ability to make referrals to the behavioral health specialist, EAP or like services, so that these services are made available to individuals as a resource to improve their job performance. Individuals who receive evaluations and counseling must be assured that it is both non-punitive and confidential.

BEHAVIORAL MODIFICATION

Often through modifying a behavior, issues that once seemed insurmountable can become manageable. Research has shown that how or what an individual thinks can have a direct impact on moods, emotions and reactions to a situation. Contrary to popular belief, events or situations do not determine an individual's mood, but rather how the individual thinks about the event or situation can determine their mood or reaction. Two people can face the same situation or event and have two very different reactions. That is because the situation or event is interpreted in the individual's mind, the thoughts are then translated into feelings about that particular scenario. The relationship between thinking and feeling, or the mind-body connection, has been well documented.

Within this context — if thinking affects feelings, then if an individual can change or modify their feelings or behaviors they will then change the way they think about a situation or event. Often times, an individual's thinking can be distorted, inaccurate or irrational, which is a major cause of negative moods such as sadness, anger, anxiety and guilt. In general people do not think about their thinking because it is automatic and seems fixed, but through practice and strengthening positive attitudes, behavior modification can alter negative moods or reactions to help facilitate more constructive ones.

Establishing a behavioral health program and having the resources of a behavioral health specialist can help assist individual's who are in need of behavior modification. Ensuring that all uniformed personnel receive the necessary assistance and/or tools to deal with the stresses of everyday life and those unique to the fire service will benefit not only the individual and their family, but the department as well.⁷

EMPLOYEE ASSISTANCE PROGRAM

An Employee Assistance Program (EAP) or Labor/Employee Assistance Program (L/EAP) is essentially a cost effective, humanitarian, job-based strategy to help individuals whose personal problems impact their work performance.⁸ Such programs are designed to assist with identifying and resolving problems that are associated with an individual's occupation. The EAP or L/EAP should be incorporated into the concept of total wellness and address potential concerns specific to the fire service. A uniformed member's primary need for assistance often may be accompanied by other underlying problems which may re-

quire support, counseling or intervention. An effective EAP or L/EAP can restore the uniformed personnel to a healthy and fully productive life, improve employee morale, and increase the productivity of the entire department.

Effective intervention through such programs should include and be accessible in any of the following circumstances: employee request; supervisor suggestion or recommendation; adverse employee job performance; or an agreement that establishes EAP or L/EAP participation as a condition of employment.

Assistance programs can address a wide range of issues pertaining to the health and well-being of active and retired uniformed personnel, as well as their families. The scope of problems a L/EAP deals with may include areas such as: substance abuse issues; addictive behaviors; stress; marital concerns; family and child issues; domestic violence; anger management; legal and financial problems; critical incident stress (including post-traumatic stress disorder); cumulative stress; workplace violence; and death/grief counseling. As these programs become more diversified, other issues have become a part of these programs including: medical issues; infectious disease and HIV/AIDS issues; career/vocational concerns; organizational problems; gambling addictions; veterans affairs; occupational diseases; disabilities; and lay-off/suspension/termination. Health promotion and health education programs may also be included in L/EAP.

Employees should be able to access L/EAP services without going through the department's behavioral health specialist. Having direct access to L/EAP is an important component. Since the background and training of the behavior health specialist is conducive to the topics addressed within a L/EAP and can help set up direct access to services in departments that do not have such services or access. If an individual requires comprehensive counseling it is recommended that they are referred to a licensed mental health professional. The mental health professional should be trained in the field of traumatic stress and other issues specific to uniformed personnel.

Fundamental to any EAP or L/EAP design is the guarantee of complete confidentiality and the assurance that job security or future promotional opportunities are not jeopardized by the employee's use or need for services that are provided through such a program.⁹ It is essential that the employer and employee are informed and have access to Title 42, a federal law that requires **confidentiality of employee's records** in any organization which utilizes federal funds. In addition, many states have specific legislation that addresses the issue of provider-patient privilege for licensed health care providers.

For those departments without L/EAP services, behavioral health program elements can be provided through specialized services, such as those described in the following sections.

SUBSTANCE ABUSE

There are many reasons to what leads an individual to become dependent upon and abuse alcohol and drugs, but it leads to and becomes a health risk behavior. Alcohol and drug abuse are not problems that are confined to the user, in fact, the people most affected by alcohol and drug problems may be those closest to or dependent upon the user (e.g. family, friends and coworkers). Therefore, individuals who have crossed over into health risk behavior from their alcohol and/or drug abuse should know that there is help available.

■ Alcohol

Alcohol is by far the most abused substance. Alcoholism has been recognized as a treatable disease by the American Medical Association since 1956. In most cases it is an employee with a problem and not a problem employee. Because it is a progressive illness, it takes time for alcoholism to become a chronic problem which can result in poor job performance. Whenever possible, troubled workers should receive early intervention with referral to a credible substance abuse program. Early intervention will benefit the alcoholic, the alcoholic's family, and the fire department. Successfully treating alcohol problems will cost society ten times less than the current cost of alcohol problems.¹⁰

Alcohol and drug users frequently have a difficult time knowing that their use has crossed the line and becoming a health risk behavior. The abuse of alcohol is defined as an unhealthy pattern of use with one or more of the following occurring within a 12-month period, including: use resulting in failure to fulfill major work, school or home obligations; recurrent use in situations in which it is hazardous; recurrent alcohol related legal problems; continued use despite knowledge of problems caused by or aggravated by use.

■ Drug Abuse

It is important that department policies reflect a strong commitment to a workforce that is free of substance abuse. Each department should establish a policy that explicitly states, neither the use of illegal substances nor the abuse of legal and/or controlled substances will be tolerated. The department's stand and policy regarding substance abuse should be made clear to all applicants for all department positions. Moreover, a strong policy against substance abuse for new hires helps to ensure a drug free career and department. Substance abuse education should be an ongoing part of a department's substance abuse program and treatment should be made available to those who require or request it.

It is important to emphasize that drug testing does **not** belong within the context of the Wellness-Fitness Initiative.

Most departments have new hire and for cause drug testing policies, while some others have a random, mandatory testing policy. Whatever the case, drug testing is separate and apart from this Initiative and in no instance should drug testing be a part of the annual medical examination and its blood or urine tests. If drug testing were to be included within the Wellness-Fitness Initiative it will only create resistance to medical evaluation and physical examination.

The purpose of a substance abuse program in the behavioral health component of the Wellness-Fitness Initiative is to emphasize rehabilitation, not termination, of the affected individual. Rehabilitation of the individual is the most effective and compassionate means of retaining a valuable member of the department.

A functional and credible substance abuse program is necessary if a department hopes to intervene with a troubled employee in a timely manner. The department should support the treatment and rehabilitation of an individual and foster an environment in which s/he can come forward to request help. A substance abuse program is most effective when specialized help is made available and readily accessible. The program must be strictly confidential while it fosters the individual's recovery from substances such

■ Tobacco Use and Cessation

The Wellness-Fitness Initiative includes the following Tobacco Cessation Policy:

- All new fire department candidates shall be tobacco free upon appointment and throughout their length of service to the department.
- Current fire department uniformed personnel shall not use tobacco products (cigarettes, cigars, and/or chewing tobacco) inside the work-site, within or on fire department apparatus, or inside training facilities.

A fire department sanctioned tobacco cessation program shall be made available to incumbent tobacco users. Tobacco cessation programs must be non-punitive and must include both short and long term goals.

The IAFF and the pharmaceutical company Pfizer are working together to help the IAFF become the first smoke-free union in North America. This initiative includes information on the health risks of smoking and the benefits of quitting, tips on how friends and family can help a smoker quit and information on how to encourage health insurance plans to make sure they cover smoking cessation.

Smoking is the number-one cause of premature death and a significant contributor to heart disease, lung disease and cancer. It is also the leading cause of fires, including fires that have claimed the lives of IAFF members. Medical data

clearly show that tobacco use is not compatible with healthy uniformed personnel and is damaging to one's health. The use of tobacco, whether through smoking or smoke-free products, is contrary to the philosophy of this Initiative and the goals of a comprehensive wellness-fitness program and damaging to the benefits secured by existing presumptive heart and lung laws.

Several tobacco cessation programs have been well-studied and have been found to be safe and effective. Success rates appear to improve when tobacco users who are family members (e.g., spouses) close friends, or co-workers (e.g., other uniformed personnel) stop smoking at the same time. Types of programs currently include the use of hypnosis, acupuncture, nicotine chewing gum, nicotine patch, clonidine patch, and varenicline (Chantix). All such programs have been found to be far more effective when coupled with counseling for behavioral modification. Thus, the best tobacco cessation programs represent a joint effort between the physician, other health care providers, trained counselors, and the support of family and friends.

Many tobacco users are concerned about weight gain following tobacco cessation. This concern is justified but, not everybody gains weight when they quit using tobacco.¹¹ Studies have documented a moderate 6-8 pound weight gain following smoking cessation.¹² This weight gain occurs regardless of the type of smoking cessation program and is due to increase in appetite, slowing of metabolism because the loss of the stimulant effects of nicotine, as well as an increase in food intake and poor food selection.¹³ Weight gain must be addressed by tobacco cessation programs. All tobacco cessation programs utilized as part of this Initiative should be coupled with formal nutrition and exercise programs using the same goals and protocols previously discussed in this document. All programs should include follow-up counseling and re-enrollment of individuals in a tobacco cessation program whenever necessary.

In general there is good news with the number of people who still use tobacco products declining. The health risks from smoking, whether to uniformed personnel or to the general population, are now so well known that many businesses, advocacy groups, and individuals are making their concerns known. The majority of state governments have responded with laws that restrict or prohibit smoking in public places. States and Provinces that prohibit smoking in public, and heavily tax cigarettes, have seen a decrease in the number of smokers. For every ten percent rise in tobacco price, there is a four percent reduction in adult smokers, and a seven percent reduction in youth smokers. By 2005, the percentage of U.S. adults who smoked was half of what it was in 1965. Smoking among young people reached its lowest level since monitoring began.

It is important to note that tobacco use is one of the most challenging behaviors to change once someone becomes a

regular user. Like a great many things that are hard to change, changing from tobacco dependent to tobacco free can have great rewards. People who quit reduce the risk of heart attack, lung disease and many cancers. In addition, they have the satisfaction of eliminating an addiction that was perhaps more compelling to them than any other habit in their life. People who become tobacco free can set an important example for everyone in their network.

To learn more about the IAFF/Pfizer Campaign for a Smoke-Free Union, visit our web site at www.iaff.org/smokefree.

STRESS

■ Stress Management

An effective stress management program can significantly enhance individual job performance by minimizing job-related and personal stresses. Stress management programs can be made available within the department, through outside sources, or from internal clinical services. Such programs may utilize self-management, trained peer-based programs, or professional sources of help. The various programs should be dependent upon the degree of stress and type of assistance that is required. Stress management programs for uniformed personnel should address issues such as: job stress; family relations; financial or legal concerns; and personal concerns or fears related to issues such as infectious disease exposure or post-traumatic stress disorder.

Prevention programs are the most logical means of reducing the effects of stress on the emotional and physical health of the individual. Stress prevention efforts may be provided through the behavioral health component and with the assistance of the behavior health specialist and can include behavioral training that begins with each recruit class in the academy during recruit training; having new hires learn how to recognize reactions to stress; incumbent uniformed personnel visiting the academy to provide recruits with realistic insights concerning the stresses that can occur on the job throughout their careers; incorporating on-going stress management awareness into personnel training; emphasizing the value of exercise as a tool to reduce stress; reviewing stress management techniques during promotional and paramedic training; taking available stress assessment tools so personnel may self identify stress and access support resources.

■ Job Stress

The work of fire service personnel is characterized by long hours, shift work, sporadic high intensity situations, strong emotional involvement, life and death decisions, and exposure to extreme human suffering. This type of work may eventually impose undue stress upon an individual and his or her family. Often, uniformed personnel cannot deal with the stress associated with their career on their own and over time it can become a disability with a need to seek out additional help in dealing with the stress.

Stress is now recognized as a major contributor to a variety of individual health problems.¹⁴ Fortunately, stress management services relieve these pressures by providing counseling, critical incident stress management, and education to prevent debilitating effects of stress. Some departments have found that offering peer counseling programs, in addition to the services of an EAP or L/EAP has been of great assistance to aid personnel.¹⁵ **Such trained peer based counseling programs need to include recruitment, screening, mentoring, and continuing education in order to maintain the high level of effectiveness.**

■ Family Relations

The demands of the fire service profession may eventually take its toll upon marriages and families. Psychological stress, substance abuse, and emotional unrest can be displaced onto the family. One study reported a high divorce rate among fire fighters, increasing with rank and, presumably, with years of service.¹⁶

Having family problems and stress coupled with the high stressors of the profession will place additional burdens on uniformed personnel. In order to have individual's maintain a healthy balance and be effective employee's it is of utmost importance to have resources available for uniformed personnel who may need to seek help for their familial relations.

■ Infectious Disease Issues

On the job, uniformed personnel come in contact with individuals who have been exposed to or are infected with contagious diseases such as hepatitis B, tuberculosis, viral meningitis, meningococcal and pneumococcal diseases and HIV/AIDS.¹⁷ The exposed or infected individual is not exclusively a person who is being rescued or treated at an emergency site, but may be a coworker.

Counseling and educational workshops for personnel and their families can help alleviate stress from being exposed to and potentially infected with a communicable disease. Education is one of the most formidable weapons for attacking the anxiety, hostility, fear, and ignorance associated with infectious disease issues.

■ Critical Incident Stress Management (CISM)

CISM includes a variety of components and helps to address the reactions from an event that may temporarily overwhelm an individual's usual coping abilities. CISM interventions may be utilized pre-incident, during the event, as well as post-incident. The interventions can take the form of one-on-one, small groups, and/or large group format(s) and is dependent upon the needs of those who are affected. The goals of CISM interventions are to provide an assessment, information, support, and referrals, if necessary to normalize common reactions, bolster the emergency responders' inherent resiliency, and reinforce

constructive coping strategies for either an individual or an entire group.

The following are examples of incidents that may result in a CISM team response: line-of-duty deaths; serious line-of-duty injuries; suicide of a fellow employee; disaster or a multi-casualty incident; significant event involving children; knowing the victim of the event; prolonged incident with loss of life; excessive media interest; personnel placed in extreme danger (hostage, assaults) or any significant event.

Each of the following CISM options is considered another "tool in the toolbox." The combination of "tools" that will be utilized is dependent upon the particular situation, as well as the specific needs of the individual or group involved. The following options are all potential CISM interventions: pre-incident education and preparation; on-scene support services; large group interventions (demobilization, Crisis Management Briefing, respite/rehabilitation centers); small group intervention (Crisis Management Briefing, defusing, Critical Incident Stress Debriefing); individual crisis intervention; pastoral crisis intervention; family support services; organizational and staff consultation; post-incident education; and follow-up and referral.

The members of the CISM team who would implement these tools may include CISM-trained, licensed mental health and/or medical professionals as the primary providers of the intervention(s). However, CISM programs are designed, and work best, when they are peer driven and clinician guided. Therefore, it is imperative that an effective CISM program has a complement of CISM-trained licensed professionals, peers, and chaplains who go through a rigorous process of selection, training, and on-going evaluation, including mandatory continuing education.

■ Post Traumatic Stress Disorder (PTSD)

When disasters occur, the risk of post traumatic stress disorder (PTSD) becomes much greater. Disasters affect whole neighborhoods, towns, cities or countries. During disasters, an entire city's resources may be mobilized to help restore the hundreds or thousands of people affected. Without fail, uniformed personnel are on the frontline, the first to respond to any such disaster. In addition, uniformed personnel often stay on the scene of the disaster for days and weeks if a lengthy recovery operation is necessary. When the magnitude and scope of trauma is so great, the demands on uniformed personnel's time, strength and energy is equally great.¹⁷

The physical and emotional demands of rescue and recovery do not always allow for uniformed personnel to attend to their own needs. Often taking shortcuts with sleep, nutrition and remaining connected to their families in the

aftermath of disasters. These shortcuts can short-circuit the individual's physical and psychological health. Hours and days on the scene of a disaster can take a heavy emotional toll. Unexpectedly gruesome sights, mass casualties or loss of friends or family during a disaster can put even the most senior and seasoned uniformed personnel at risk for PTSD.

The prevalence of PTSD in uniformed personnel is higher because of the greater exposure to trauma or critical incidents they experience. Factors related to the development of PTSD include: greater critical incident duration, intensity, unpredictability, uncontrollability, real or perceived responsibility and betrayal associated with the critical incident; greater perceived threat from the critical incident or greater terror and horror in reaction to the incident; family history of psychiatric illness; ongoing stressful life events at the time of the critical incident; lack of social support; and a social environment that promotes shame, guilt, stigmatization, or self-hatred.

Traumatic events which can trigger typical traumatic stressors leading to nightmares or intrusive thoughts (re-experiencing), avoidance or numbing (avoiding people or places associated with the event) and increased arousal (irritability, difficulty concentrating and sleeping). An individual can avoid suffering, as well as that of their family and co-workers if these symptoms are addressed early on. At the same time, individuals who have suffered from PTSD for years, or even decades, can get relief and resolution with appropriate treatment.

An appreciative community's gratitude toward uniformed personnel often comes with the label of "hero." In fact, many of the actions at the scene of an accident, fire or disaster are indeed heroic. But the label can come with an unintended side effect making uniformed personnel feel that they themselves should not require help and that if they do need help that all is lost.

Vulnerabilities arise if problems go unaddressed and begin to erode functioning, family and friends. Uniformed personnel who work disaster scenes should take more care, not less, to make sure that they and their families, who are also very affected by disasters, are physically and emotionally safe. Maintaining a balance during such times will allow uniformed personnel to meet the extraordinary needs of the disaster aftermath.

Related to PTSD, but differentiated primarily by the time in which it occurs is Acute Stress Disorder. Acute Stress Disorder generally occurs within the first 30 days following exposure to a trauma or critical incident. This disorder involves many of the same symptoms seen in PTSD including the symptom clusters of re-experiencing (nightmares, intrusive thoughts), avoidance and arousal (anger

and irritability, sleep and concentration difficulties). If these symptoms continue 30 days after the trauma an individual may be at greater risk for PTSD.

MARKETING AND AWARENESS OF PROGRAM

To raise awareness of the behavioral health program it is necessary to undertake initiatives which educate all individuals about the program itself, as well as its effectiveness, confidentiality, and availability to individuals and family members via direct home mailings and staff involvement. All uniformed personnel should be made aware of the diverse services provided through the behavioral health program by means of regular notices. Program awareness can also be made available in alternate ways, such as distribution of literature, availability of website resources, posters, and training academies.

Probationary members should receive a comprehensive introduction to the behavioral health program and be encouraged to utilize the services and resources available through the program. All department supervisors should receive on-going training to be fully knowledgeable in the components of the program and how individuals can access services. Many of the issues addressed within the program are highly sensitive and complete confidentiality and discretion must be practiced and should be the hallmark of the behavior health program.

SUMMARY

The concept of an individual achieving wellness must be approached holistically, and includes the well-being of their physical, medical, and behavioral states. The connection between the mind and body has been well-researched and documented, however for uniformed personnel there are other factors that must be taken into account. In providing emergency services to the public individuals may experience some of the most tragic aspects of life, as well as not having any control over the events in which they witness. Being exposed to such circumstances can create stress responses that are or can become troublesome to the individual, contributing to negative job performance, psychological and behavioral symptoms. Decreasing job productivity can further the stress that an individual experiences which will continue to have a wide variety of negative impacts on their ability to cope at work, home and in the community.¹⁹

The need to implement and integrate behavioral wellness programs in departments is essential in ensuring that all uniformed personnel are able to access and receive the resources needed to deal with the stressors that are unique to uniformed personnel. To achieve the maximum potential for all uniformed personnel the idea of wellness must be incorporated at both an individual and department level. The goal of a behavioral health program allows both the individual and their supervisors to be aware that all di-

mensions of a persons life is interconnected and can contribute to a healthy lifestyle. The basis for many wellness programs integrates, learning to manage the six dimensions of life — occupational, physical, spiritual, intellectual, emotional and social²⁰ — and are applicable to almost every aspect of life and can lead to the path of optimal living.

A comprehensive program for behavioral health includes a well-planned, labor-management approach to education, assistance, and treatment. **Fire departments must measure the investment in a comprehensive behavioral health component in more than its financial costs.** Personnel suffering emotional or behavioral problems may negatively impact the overall effectiveness of a department. This can manifest itself in increased absenteeism, increased accidents, poor customer service, or poor performance of routine and required duties. An employee who is physically and emotionally fit is the foundation of the fire service and its ability to deliver the service that the public demands and deserves. To learn more go to the IAFF website at www.iaff.org/ET/JobAid/EAP/eap.htm

ENDNOTES

- ¹ State and Local Government Labor-Management Committee: Joint Solutions to Substance Abuse.
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CHAPTER 6 — Cost Justification

Management and labor shall work together to reduce injuries to uniformed personnel, and the associated costs, by fully implementing the Fire Service Joint Labor management Wellness Fitness Initiative.

This chapter highlights the following:

- Introduction
- Methods of Collection
- Measurement and Outcome
- Costs and Claims of WFI Departments Versus Non-WFI Departments
- Discussion
- Economic Indicators of Fire Department Wellness
- Cost of Fire Fighter Wellness Programs and Return on Investment (ROI)
- Summary
- Endnotes

INTRODUCTION

Uniformed personnel are at an increased risk for musculoskeletal injuries and cardiorespiratory illness compared to other occupations.¹⁻² Occupational injuries are the leading cause of disability and/or early retirement for uniformed personnel, and cardiovascular disease is the most common cause of work related death.³⁻⁶ Fire fighters must perform physically intense work in extraordinary environments including high heat, low oxygen, high carbon monoxide and other combustible products. In addition to these job-related hazards, cardiac risk factors are higher among fire fighters than other comparable worker groups.⁷ As uniformed personnel age, there can be an increase in the prevalence of inactivity, hypertension, lower fitness level, and obesity.⁸ Although the work-related death rate is lower than several occupations, fire fighters' rate of injury is markedly higher than other comparable jobs, with the annual injury rate 8.6 times that in mining.⁹

Tens of thousands of fire fighters are injured each year while fighting fires, rescuing people, responding to hazardous materials incidents and training for their job. While the majority of these injuries are minor, a substantial number are debilitating and career ending. These injuries contribute to a significant human and financial toll to personnel and the jurisdictions where they work, through lost work hours, higher insurance premiums, overtime, disability and early retirement payments.

In recent years health care costs have risen dramatically, in the past year alone a 12 percent increase was seen in both the public and private sectors.¹⁰ Administrators are calling for more rigorous use of economic evaluations to guide resource allocation and spending. This is especially true in city and county governments with regard to the rising

costs of fire and police agencies.¹¹ One strategy used to control the rising health care costs is to implement worksite health promotion.¹² The rationale for worksite health promotion has been well documented from research outside of the fire service. A number of studies have addressed the question and have shown a favorable Return on Investment (ROI),¹³⁻¹⁷ for comprehensive health promotion programs. In fact, over 143 studies demonstrate positive ROI associated with worksite health promotion. Examination of the this peer-reviewed literature concludes that the financial benefits of well-designed, well-implemented health promotion programs substantially exceed their costs and have a positive ROI and benefit/cost ratio.¹⁸⁻²⁰

While worksite wellness programs have achieved economic success, initial start up costs can be expensive to implement and may not always be viewed as cost effective, especially in the short-term.²¹ In addition, most of the programs studied were in white collar or management industries, and the favorable outcomes were in the reduction of medical costs for chronic illnesses, rather than musculoskeletal injuries that are common in fire fighting. In general, most fire departments have limited "wellness" resources and services available to the uniformed personnel. Thus, fire service decision-makers debate whether or not an adequate ROI is available for the amount of time, effort, and energy that go into implementing and maintaining a fire fighter health promotion program.

In 1996, the IAFF and IAFC, in conjunction with 10 fire departments in North America, created and adopted the Fire Service Joint Labor Management Wellness-Fitness Initiative (WFI). Components of the WFI include a medical evaluation, fitness assessment, injury prevention and rehabilitation, behavioral health, and data collection (department injury and associated cost). The WFI is designed to improve the quality of life for all fire fighters²² while simultaneously seeking to prove the value of investing wellness resources over time. One of the major roadblocks in preventing fire departments from implementing the WFI is cost and concerns about the economic benefit of such a program. Therefore, the objective of this chapter is to determine the economic impact by calculating occupational claims and costs among the charter fire departments that adopted and implemented the WFI.

METHODS OF COLLECTION

In 2006 and 2007, Human Resources and Risk Management Sections of the original 10 fire departments were contacted to acquire aggregated data on workers' compensation claims, lost work hours, and total incurred costs, prior to and after implementation of the WFI. Eight of the fire departments had sufficient data to be included in this report (Table 1), but only four had adopted tracking cost information prior to and after implementation (Fairfax County, Virginia; Indianapolis, Indiana; Los Angeles County, California; and Phoenix, Arizona). The other four fire departments for various reasons, did not advance in the adoption of policies, procedures, and practices recommended in the WFI, however, they did track occupational injury and illness claims and cost information to act as comparison or control sites (Austin, Texas; Calgary, Alberta; Miami-Dade, Florida; and Seattle, Washington). Table 1 shows the departments that participated in this project and their participation rates. Wellness-Fitness Initiative fire departments have a mandatory, non-punitive policy for individual participation and the participation rates increased steadily over the course of implementation from an average of 54 percent in the first year to 79 percent in 2004.

By working with each department, we were able to gather occupational injury/illness claims, disability costs, lost work hours, and total incurred costs annually for a period of at least five years prior to (as a baseline) and after implementation of the WFI. We attempted to account for missing information by either not including the specific individual data into the total, or extrapolating from similar data the extent of the injury and cost of a claim. All participating fire departments had a computerized system of injury and cost tracking with site-specific unique software that was either developed internally by the department or purchased externally.

The study did not focus on the type or severity of injury, but simply the total number of claims. In addition, measurements were obtained including calculations on the average cost per claim, however, this is an indirect indicator of the severity of injury/illness, total days lost and the total annual incurred disability costs. One limitation of this data is that it only represents occupational injuries or illness, which likely underestimates the positive impact of implementing the WFI since some reports suggest one-third to one-half of fire fighter injury or illness time loss is non-occupational. For example, a fire fighter hurt off shift is not considered a reportable injury and is not included in this dataset. That type of injury or illness would only be tracked by the use of sick leave. Since a fire fighter does not have to report why they are using sick leave, reporting and tracking the impact of the WFI on off-shift or non-occupational injuries is difficult. Confidentiality policies and standards were followed according to the Health Insurance Portability and Accountability Act of 1996 (HIPAA) medical standards with no ability to identify an individual fire fighter claim. All fire department data information and claims are combined then averaged between the four WFI and four non-WFI participating fire departments. Thus, the numbers represent the aggregate mean number of claims and costs for an individual fire department (mean of the 4 departments) over an annual period.

MEASUREMENT AND OUTCOMES

All fire departments aggregated claims data was combined and is summarized in the following tables and graphs. Total number of occupational claims, number of lost days, total incurred costs, and cost per claim, were assessed between the four WFI fire departments (Fairfax, Indianapolis, Los Angeles, and Phoenix) and the non-WFI departments (Austin, Calgary, Miami-Dade, and Seattle)

Table 1: Participating fire department sites

FIRE DEPARTMENT	UNIFORMED PERSONNEL	WFI PARTICIPATION RATE IN 1997	WFI PARTICIPATION RATE IN 2004
Austin, TX	1032	CONTROL	CONTROL
Calgary, ALB	983	CONTROL	CONTROL
Fairfax County, VA	1280	65%	85%
Indianapolis, IN	780	70%	95%
Los Angeles County, CA	3013	10%	50%
Miami-Dade County, FL	1900	CONTROL	CONTROL
Phoenix, AZ	1588	70%	90%
Seattle, WA	1005	CONTROL	CONTROL

for seven years prior to and after implementation of WFI among WFI and non-WFI fire departments. As stated above, data from each department was totaled, then combined and averaged between the four WFI participating and four non-WFI fire departments. In doing so this removed any ability to identify an individual fire department's cost data, therefore allowing each participating department to maintain financial confidentiality. The numbers presented, represent the mean number of claims and costs for one fire department (mean of the four departments) over an annual time period. The numbers of lost days from claims were available from some of the departments. Lost work hours data was also extrapolated and averaged from just those fire departments and adjusted for all the departments to get the estimated average number of lost days and hours per site.

The mean total claims, lost hours, and total incurred costs represent service or occupational benefits paid per fiscal year for a department. Data from these fire departments do not include any non-occupational claims and costs because of the difficulty in tracking this type of information through private insurance and individual medical providers. This exclusion of non-occupational injuries in

the cost table below will logically cause the numbers to underestimate the cost savings and potential impact of the WFI intervention.

COSTS AND CLAIMS OF WFI DEPARTMENTS VERSUS NON-WFI DEPARTMENTS

In Table 2 the summary data shows the WFI sites (Fairfax, Indianapolis, Los Angeles, and Phoenix) and non-WFI sites (Austin, Calgary, Miami-Dade, and Seattle) beginning with pre-implementation, 1991-1997, to post implementation, 1998 - 2004. Pre-implementation, for the WFI sites, there were a total of 3,033 claims, with a total of 40,611 days lost, and an incurred cost totaling \$21,695,644, an average cost per claim over the seven years was \$56,845 per department. For the seven years post WFI implementation, there was a 5 percent increase in claims, a 28 percent reduction in days lost, a 3 percent increase in total incurred costs to \$22,276,143, and a 23 percent decrease in the average cost per claim. By contrast, in the non-WFI departments there was a 22 percent increase in claims from 1991-1997 to 1998 - 2004, a 55 percent increase in days lost, a 58 percent increase in total incurred costs, and a 35 percent increase in average cost per claim per fire department.

Table 2: Mean Occupational Claims, Loss Work Days, Total Incurred Costs, and Average Cost Per Claim For WFI and Non-WFI departments.

	Implementing WFI					Not Implementing WFI			
	Claim Date	WFI Claims	Lost Work Days	Total Incurred Cost*	Average Cost Per Claim	Non-WFI Claims	Lost Works Days	Total Incurred Cost *	Average Cost Per Claim
PRE	1991	401	4,213	\$1,582,424	\$7,645	344	3,689	\$2,243,993	\$6,699
	1992	407	4,753	\$1,951,752	\$7,571	339	3,899	\$2,155,654	\$6,553
	1993	429	5,759	\$2,418,216	\$7,626	347	3,431	\$2,402,384	\$6,900
	1994	436	6,085	\$3,576,916	\$8,146	359	3,220	\$2,385,562	\$6,697
	1995	438	6,326	\$3,600,762	\$8,247	342	4,441	\$2,702,118	\$7,279
	1996	434	6,895	\$4,236,084	\$8,321	372	4,189	\$2,764,044	\$6,724
	1997	488	6,580	\$4,329,490	\$9,299	256	3,878	\$2,401,968	\$7,060
	Totals	3,033	40,611	\$21,695,644	\$56,855	2,359	26,747	\$17,055,723	\$47,912
POST	1998	386	3,351	\$2,458,116	\$6,233	371	3,515	\$2,536,780	\$7,278
	1999	400	3,834	\$2,627,379	\$6,177	387	4,672	\$3,104,697	\$8,167
	2000	435	4,716	\$2,891,569	\$6,391	442	5,823	\$3,476,799	\$8,517
	2001	452	4,847	\$3,075,238	\$6,115	464	6,404	\$3,806,243	\$8,856
	2002	498	4,725	\$3,688,405	\$7,175	428	6,335	\$4,080,519	\$10,054
	2003	531	4,702	\$3,871,945	\$7,061	449	7,208	\$4,919,355	\$11,146
	2004	508	5,496	\$3,663,493	\$7,073	482	7,431	\$5,067,383	\$10,590
	Totals	3,210	31,671	\$22,276,145	\$46,225	3,023	41,388	\$26,991,776	\$64,608
	Percent Change	5%**	-28%	3%**	-23%	22%	55%	58%	35%

*All costs are adjusted to 2001 U.S. dollars

Below, in Figure 1 is graphical representation of Table 2, which shows the percentage change in claims, lost work-days, total costs, and average cost per claim for a WFI department versus a non-WFI department. Statistically, there was a significant difference ($p < .026$) for occupational claims and costs between the fire departments that implemented the WFI and those sites not implementing the WFI. Regarding occupational claims, there was a 5 percent increase over the 7 years for a WFI department versus a 22 percent increase for a non-WFI department over the 7 years. For a non-WFI fire department, this represented an increase of 81 claims per year when compared to 25 claims per year for a WFI fire department. When comparing lost hours, there is a 28 percent reduction in lost hours for the WFI departments compared to a 55 percent increase in lost hours for non-WFI departments. When assessing total incurred costs, there was a 3 percent increase in costs over the 7 years for the pre- and post-implementation WFI departments and a 58 percent increase in total costs for the non-WFI fire departments for both pre- and post-implementation.

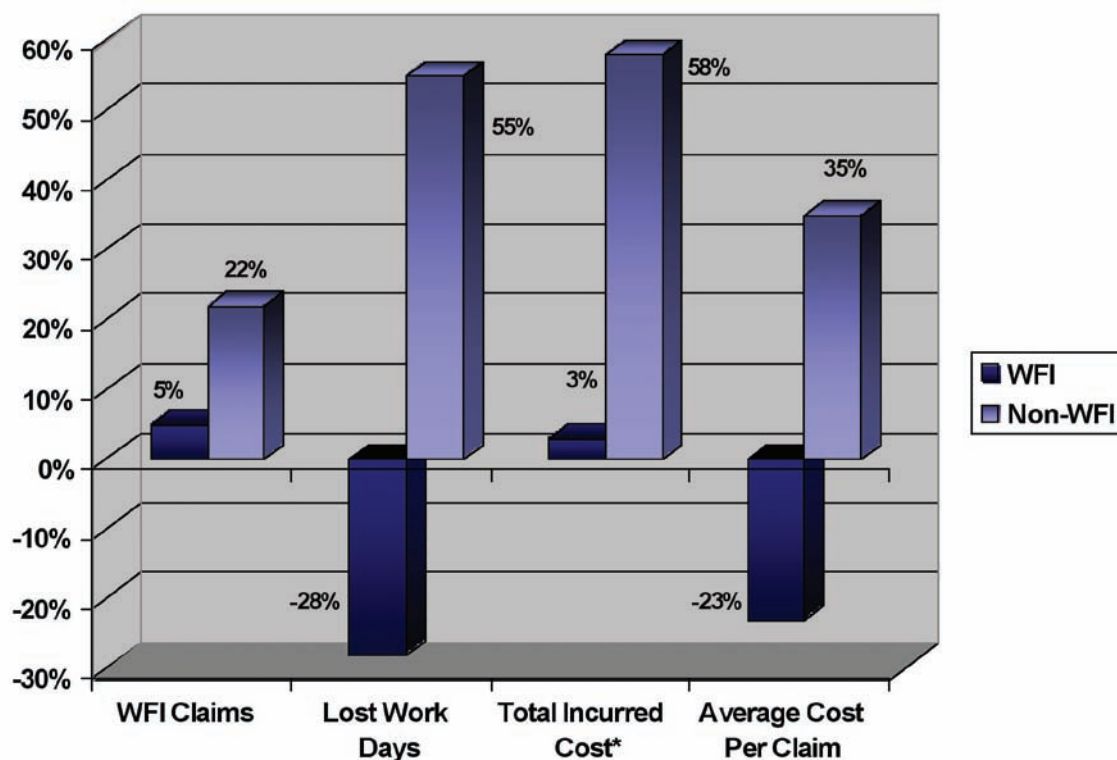
In actual dollar amounts (adjusted to 2001 U.S. dollars), this equates to a total incurred cost increase of \$82,900 per year, per WFI department and a total incurred cost increase of \$1,419,435 per non-WFI fire department, per

year. This represents a difference of \$1,336,535, which indicates that non-WFI departments spent over \$1.33 million dollars more per year, per department when compared to WFI departments. Results also indicate a similar cost benefit for the WFI sites as the average cost per claim was reduced by 23 percent (-\$1,518 per claim) over the seven year period for WFI sites as compared to an increase of 35 percent (+\$2,386 per claim) for non-WFI departments. When these two figures are combined, there was a savings of \$3,904 per annual occupational claim per WFI fire department as compared to the non-WFI sites. In other words, a fire department with 500 occupational claims could save \$1,952,000 per year. This potential savings, nearly \$2,000,000 annually, per WFI department is from occupational claims alone and probably underestimates the potential longer-term savings from other wellness interventions including non-service related injuries, early screening and detection of disease, and behavioral health program components. See Figure 1 below.

DISCUSSION

The information presented suggests an interval reduction of occupational injury and illness claims and costs among fire departments that implemented the IAFF/IAFC Wellness Fitness Initiative when compared to fire departments that had only partially implemented the WFI. The results

Figure 1: Percent change in Claims, Lost hours, Costs and Average claim cost between WFI and Non WFI departments 7 years pre and post implementation.



also demonstrate that the WFI fire departments have a lower rate of increasing claims and costs, while simultaneously decreasing lost hours and average cost per claim. The fact that lost hours and average cost per claim is reduced suggests that injury and illness severity is reduced, especially in the face of rising health care costs that are greater than the rate of inflation. Therefore, adoption of the WFI confers a savings in the short term. We conclude that the long-term economic benefit could be much greater by preventing and reducing premature fire fighter musculoskeletal injuries and cardiovascular disease through a comprehensive health risk screening and health promotion program which also avoids the passive impacts of reducing off-duty injury and illness costs.

Were there other factors that may have contributed to this observed reduction in occupational claims and costs among the WFI departments when compared to the non-WFI departments? It is important to understand the difficulty in obtaining specific, reliable, and valid injury and illness, and workers' compensation information from departments. Human Resource and Risk Management departments have strict policies that protect and preserve medical confidentiality. This component coupled with collecting data retrospectively rather than tracking and collecting prospective information as in a prospective study is very difficult. In any event, the data collected is substantial and represents a significant analysis of positive impact on return on investment (ROI) through WFI implementation. With some of the other registry data that is available, from a national level, an understanding exists regarding inherent problems in registries and that many assumptions and variability occur in fire fighter injury and illness reporting systems.

In 2000, the National Fire Protection Association (NFPA) reported 84,550 fire fighter injuries that required medical treatment and resulted in at least one day of restricted activity.²⁵ The national fire fighter injury rate reached its lowest level of 78,000 in 2004; however, the NFPA estimates that 80,100 fire fighter injuries occurred in the line of duty in 2005.²⁶ This is an increase of 5.6 percent and the highest fire fighter injury rate since 2002. An estimated 19,900 injuries or 24.8 percent of all fire fighter injuries resulted in lost work time in 2005. Of interest to note, during the same period, 1990–2004, trends in fire fighter injuries decreased in the U.S. despite an increase in department's disability budgets.²³⁻²⁴ One of the reasons for a reduction in injuries is due to a decrease in the number of

responses and actual fires; however, the rate of injuries at the fire scene remained the same.⁹ According to the NFPA, the rate of fire ground injuries per 1000 fires over a 15-year period (1988–2002) ranged from a high of 28.3 registered in 1990 to a low of 22.4 in 2002.²³ Another reason the estimated number of injuries dropping during this period is partially due to additional questions on exposures and a change in tracking and categorizing annual injury and fatality survey reports. However, it appears from the occupational claims and cost information collected for this project, among the control sites, there has been a steady increase in fire service related occupational claims, costs, and lost hours.

ECONOMIC INDICATORS OF FIRE DEPARTMENT WELLNESS

Over the past five years, in other industries, research supports the cost-effectiveness of work site wellness programs having a positive cost benefit ratio on medical illness and injury, as well as costs by providing preventive care.¹²⁻²¹ The impact, however, of wellness-health promotion programs on uniformed personnel is less obvious. Limited scientific data is available on wellness programs in the fire service and no prospective studies exist that examine the potential economic impact of a health promotion program with uniformed personnel.

Uniformed personnel and administration officials are concerned that not enough is being done in terms of prevention (prefab) versus treatment (rehab). For instance, researchers in Oregon compared dollars spent on fire fighters health to dollars spent on apparatus maintenance and repair (Table 3). If maintenance is thought of as prevention, and repair is thought of as treatment, we can see how much a fire department spends on prevention versus treatment when comparing fire fighters to apparatus.

The example department's annual costs are 70 percent for apparatus preventative maintenance, with approximately 30 percent allocated to repair. In contrast, 97 percent of fire fighters expenditures are for work related injury and disability costs, and only 3 percent is budgeted for prevention, "fire fighter wellness." The interesting element in this scenario is that the apparatus depreciates over a 12–15 year life span with no Return on Investment (ROI) outside of functioning properly during its lifetime of use.

The benefits of wellness-fitness programs, as they relate to the reduction of fire fighter injuries, have been shown in

	Apparatus	Fire Fighter
Maintenance/Prevention	70%	3%
Repair/Treatment	30%	97%
Total	100%	100%

Table 3: Percent Cost of Maintenance (Prevention) and Repair (Treatment)

some older studies.³²⁻³⁹ A large-scale study examining the relationships among the cause, nature, and costs of fire fighter injury found that overexertion accounted for a significant portion of injuries (35 percent of all fire fighter injuries) at a cost of \$9,715 per claim.⁴⁰ Overexertion injury occurs when a physical task exceeds the capabilities of a fire fighter, which can cause injury. Some of the contributing factors to overexertion injuries are understaffing, training, unsafe environmental conditions, poor posture or ergonomically unsafe positions, and fatigue. Walton et al calculated that eliminating injuries caused by overexertion saved, on average, \$545,000 per year for a large city fire bureau from 1992-1999.⁴⁰

Other studies have examined injury prevention and the mechanism by which a cost savings is realized. One study demonstrated that an injury prevention program that improved the flexibility of fire fighters did not reduce injury rates, but did reduce the severity of an injury and thus reduce the costs associated,²⁹ which indicated that fire fighters who participated in a regular flexibility program returned to work sooner after an injury when compared to fire fighters in the control group that did not participate in a flexibility program. Another study showed that increased emphasis and education on physical fitness contributed to a reduction in fire fighter injuries and injury costs.³²

COST OF FIRE FIGHTER WELLNESS PROGRAMS AND RETURN ON INVESTMENT

Although fire fighter injuries have been well documented, the data on the costs associated with such injuries is limited. More important, the costs associated with preventing injury are not well documented.²⁷⁻²⁹ In the TriData Corporation's final report to the National Institute of Standards and Technology (NIST) and the U.S. Department of Commerce on, "The Economic Consequences of Fire Fighter Injuries and Their Prevention," states on page 36, "while wellness and fitness programs are designed to improve overall fire fighter health and reduce occurrence of injury, it is difficult to determine the annual cost of these programs."⁹ The report emphasizes that wellness programs appear to be the exception and not the rule among fire departments in the United States. The TriData report presents a general idea of what fire departments across the country pay annually for a wellness-fitness program ranging from \$0 to \$420,000 (this was representative of only eight departments with a wide range of services that were offered).

The WFI fire departments represented in this report were much larger than the fire departments assessed in the TriData report. The four WFI fire departments sites averaged 1665 fire fighters per department and had first year estimated implementation costs of \$1,550,000 per site (~\$931 per head) due to start up costs and capital expenditures. This was followed by an average annual cost of \$865,930 (~\$520 per head) for maintenance of the WFI program.

These results demonstrate that the WFI departments had a total cost savings of \$1,336,535 the first year of implementation per site (due to start up costs) and \$1,952,000 annually per site thereafter. This appears to be a positive return on investment with getting most of the initial costs back the first year and then receiving a positive return on investment of at least 1:2 for year two. Therefore, for every one dollar spent on uniformed personnel wellness, via implementation of the WFI, results in an almost immediate return of over two dollars in occupational injury and illness costs. Another positive consideration is that these numbers underestimate the true cost savings since this does not take into account non-occupational injuries and the long-term medical costs of premature morbidity and mortality. Substantial long-term cost savings are expected from preventing cardiovascular disease, certain cancers, and reducing early disability from musculoskeletal and back injury.

This report advocates that fire department wellness programs do make economic sense and that implementation the WFI alone will reduce occupational claims and costs. It is even more likely that incorporating a full behavioral health promotion program will increase this benefit. The observed trend in reducing occupational claims and costs from implementing the WFI is also supported by the ongoing PHLAME research study⁸ (website on PHLAME and cancer control P.L.A.N.E.T. (<http://rtips.cancer.gov/rtips/index.do>) which demonstrates for every dollar spent on the fire fighter health promotion program, a substantial cost savings can be realized after the short-term.³⁰⁻³¹ In addition, the health promotion activities were also associated with significant reductions in work-related injury and illness. Table 4 shows the cost savings of the PHLAME health promotion program.

Costs per Fire Fighter	Before PHLAME	After PHLAME
Prevention	\$150	\$585
Treatment	\$5,175	\$2,025
Total Costs Per Claim	\$5,325	\$2,610

Table 4: Return on Investment: PHLAME Program

SUMMARY

This report advocates that fire department wellness programs do make economic sense and that adopting and implementing an occupational wellness program, such as the WFI, alone can reduce occupational claims and costs by while simultaneously improving the quality and longevity of a fire fighter's life. In addition, adoption of the WFI is an important first step in setting up a medical screening and wellness program for fire departments.⁴²⁻⁴⁴ Adding additional behavioral health promotion programs will only en-

hance and improve cost savings. In reference to the summary report on economic consequences of fire fighter injuries compiled by TriData Corporation for the National Institute of Standards and Technology and the U.S Department of Commerce⁹ stated, “the challenge for fire departments and local governing bodies is judging how to assign the available solutions for reducing direct and indirect expenses from injuries so as to incur the best payoff. Do formal physical fitness programs and requirements make a measurable difference in reducing the rate of injuries and acute, work-related illness? If yes, then more time should be devoted to maintaining physical fitness.”

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CHAPTER 7 — Data Collection

Management and Labor shall support systems that confidentially collect medical, health and fitness data and provide analysis to improve the wellness of all fire department members.

This chapter highlights the following:

- Introduction
- The WFI Health Information Registry
- Minimum Data Set Elements
- The File Transfer Process
- The Bi-functionality of the Health Information Registry

INTRODUCTION

The Wellness Fitness Initiative (WFI) provides a comprehensive plan for the implementation of a fire service occupational health-wellness program. Where fully implemented, this program has provided a template for standardization of care and integration of various elements into a cohesive clinical program. Without question, the WFI clinical programs have saved lives and improved the quality of life for uniformed personnel in participating municipalities.

Separate and distinct from these clinical program elements, an overarching goal of the WFI has been to collect and analyze clinical and health outcome data generated in the 10 member jurisdictions which may be generalized to the wider uniformed personnel population. Since the inception of the WFI, there have been ongoing efforts to develop a centralized database which would be a repository for the collected data and information. Several prototype software efforts have made significant progress toward defining and understanding the system and software requirements of such an effort.

The development of a centralized database capable of receiving, storing and retrieving (data mining) the massive amounts of data involved as a part of this Initiative is a significant challenge. Current efforts are focused on the use of the web-based, (SQL) relational database which is housed at the headquarters of the International Association of Fire Fighters in Washington, D.C.

THE WFI HEALTH INFORMATION REGISTRY

As the name implies, the WFI Health Information Registry (HIR) is a centralized database of medical and demographic data which will be generated by the clinical programs in all 10 member municipalities. This database will provide exposure and health outcomes data for thousands of uniformed personnel across North America and will be a unique resource for medical researchers who will ultimately use the HIR to conduct studies relevant to uniformed personnel health and wellness.

Registries are well known public health tools which have a number of useful applications. The formal definition of a public health registry is “...a data base of identifiable persons containing a clearly defined set of health and demographic data collected for a specific public health purpose.”

Registries provide an organized system of data collection, storage and retrieval that allow subsequent analysis and the ability to query the information in a structured manner, which is based on categories of interest. In this way large data sets from the contributing WFI departments can be merged in an ordered manner, analyzed and retrieved to create meaningful reports on specific health conditions from the individual cases that have been entered into the data base.

Registry data offers a number of valuable uses in public health and medicine and includes: estimating the magnitude of specific health problems; determining the incidence of disease; examining trends of disease over time; identifying high risk groups; estimating health service needs; and conducting research. The ability for the fire service to have robust and validated registry data will assist in future legislative agendas.

Registries collect data on individuals who share certain characteristics, typically a specific disease or condition. This information includes demographic and medical information. Registries often seek validation of the data by collecting detailed test results, such as a pathology report from a biopsy or a specific blood test result. To read more about registries, please see FAQ on Public Health Registries at the following web address: www.ncvhs.hhs.gov/9701138b.htm.

In addition to following people with specific diseases, the registry concept has recently been applied to follow groups of people who share a common exposure history. An example of this concept is the National Exposure Registry which is operated by the Agency for Toxic Substances and Disease Registries (ATSDR), and is a part of the Centers for Disease Control and Prevention (CDC). This registry identifies and enrolls persons likely to have been exposed to hazardous environmental toxicants, usually due to the location of the person's residence near a contaminated Superfund site. The registry establishes a pool of persons, potentially at increased risk of health harm, and allows tracking of this particular group. Health authorities have the ability to track and subsequently contact registered persons, and can offer pertinent health information, opportunities for par-

ticipation in a study, or care recommendations. The course of the registrant's health may also be followed over time through periodic surveys performed by the registry.

ATSDR in collaboration with the New York City Department of Health and Mental Hygiene also operates a registry to track the health effects of 9/11. The persons enrolled in this registry not only include responders and clean-up workers, but also residents, students, workers and others within a prescribed geographic region in proximity to the event. For more information on this registry please visit www.nyc.gov/html/doh/wtc/html/registry/about5.shtml#2. These latter registry examples, of Superfund exposure or the 9/11 event provide an example of registries that are based on a shared exposure history. The IAFF registry is built on the shared exposure history model as well.

The WFI data collection effort is not a research program per se, in that a formal research initiative would be beyond the scope of the Wellness-Fitness Initiative. What the HIR does allow is systematic collection of high quality, validated medical data which will enable academic researchers to complete credible scientific studies regarding the health and fitness status of uniformed personnel. This team approach will enable the millions of dollars spent by WFI member jurisdictions, and the large amount of data collected in the course of the WFI clinical operations to be leveraged by a larger community of academic medical researchers whose analyses will in turn, inform and benefit the entire fire service membership.

MINIMUM DATA SET ELEMENTS

The goal of keeping the collection process simply has determined the data elements to be included in the registry, which will assist in the facilitation of participation. The data collected must be consistent throughout a longitudinal collection process, such as years for this project. The definitions of data items should conform to other similar well-established registries, and of course, confidentiality of the information must always be safeguarded.

This edition of the WFI includes an updated version of the data elements which will be collected and stored in the HIR. This version of data elements, compared to the initial database, has been significantly shortened and simplified. The revision of the data items was undertaken by a WFI Technical Committee when initial efforts to implement the original data dictionary revealed that the time, effort and resources required to complete the data collection were problematic for the members of the WFI. The WFI data items have been modified to include approximately 65 percent of the original data elements determined to be the minimum data set (MDS) needed to assess the health outcomes of interest in fire service members as a group. This minimum data set also allows for the collection of data in a reasonable amount of time in a clinical setting.

The MDS will consist of 93 data elements obtained from the WFI questionnaire and physical examination. Thirty-five of the 93 data points are from the questionnaire and 58 from the physical examination.

Uniformed personnel, as part of the annual WFI examination will complete a health, wellness, and fitness questionnaire that will provide 35 data elements to the MDS. Information collected will include questions in the following areas:

■ MDS Questionnaire Data Elements N=35

- **Category** (*number of questions*)
- **Demographic information** — such as gender, race, ethnicity and education level (5)
- **Current and past fire service employment** — including time and usual duties (6)
- **Illness and injury experience** — in the past year as measured by time off work (4)
- **Tobacco and alcohol** — use including estimates of quantity (10)
- **Health history current and past** — including diagnoses, medication use, screening tests, and surgeries (5)
- **Physical activity** — both aerobic and strength training (5)

The physical examination will produce 58 clinical data points for the MDS. The test results included in the MDS provide information as to the overall health and fitness of the uniformed personnel. The data points are separated into the 5 categories described below:

■ MDS Physical Assessment Data Elements N=58

- **Category** (*number of data points*)
- **Physical measurements** — such as blood pressure, height, weight, and pulmonary function (10)
- **Laboratory data** — including blood counts, liver and renal function and cholesterol (15)
- **Audiometry testing** (14)
- **Immunizations and testing for specific disease** (7)
- **Fitness testing** (12)

Collection and transmission of the MDS data elements to the IAFF health information registry will require refinement during the early implementation phase of the

process. The MDS database will also require standardized parameters for coding and allowable ranges for test results to be accepted for data entry. These standard parameters promote accuracy and assure data quality.

File design and transfer specifications will be determined and piloted in transmission exercises during the early implementation of the WFI data sharing phase.

THE FILE TRANSFER PROCESS

The IAFF health information registry which will contain the MDS data on the members whose departments participate in the WFI is housed on a Microsoft SQL server. The SQL database uses a 4GL relational data model and stores case related information on a calendar year. The interfaces to this data base will be through web portals which will allow jurisdictions to easily upload large data files through secure links to the IAFF database. Specific tasks related to data transfer are underway at present and include: development of core collection requirements and data import rules and integrations; design of server database model and schema, processes for importing and web based entry; assurance of secure site provisions for confidential health data transfer and storage; data validation rules; creations of security control SOPs and testing and

audit task methods trials development. During the design and development phase, members can input their information directly on the IAFF web site at www.iaff.org/hs/wfi.

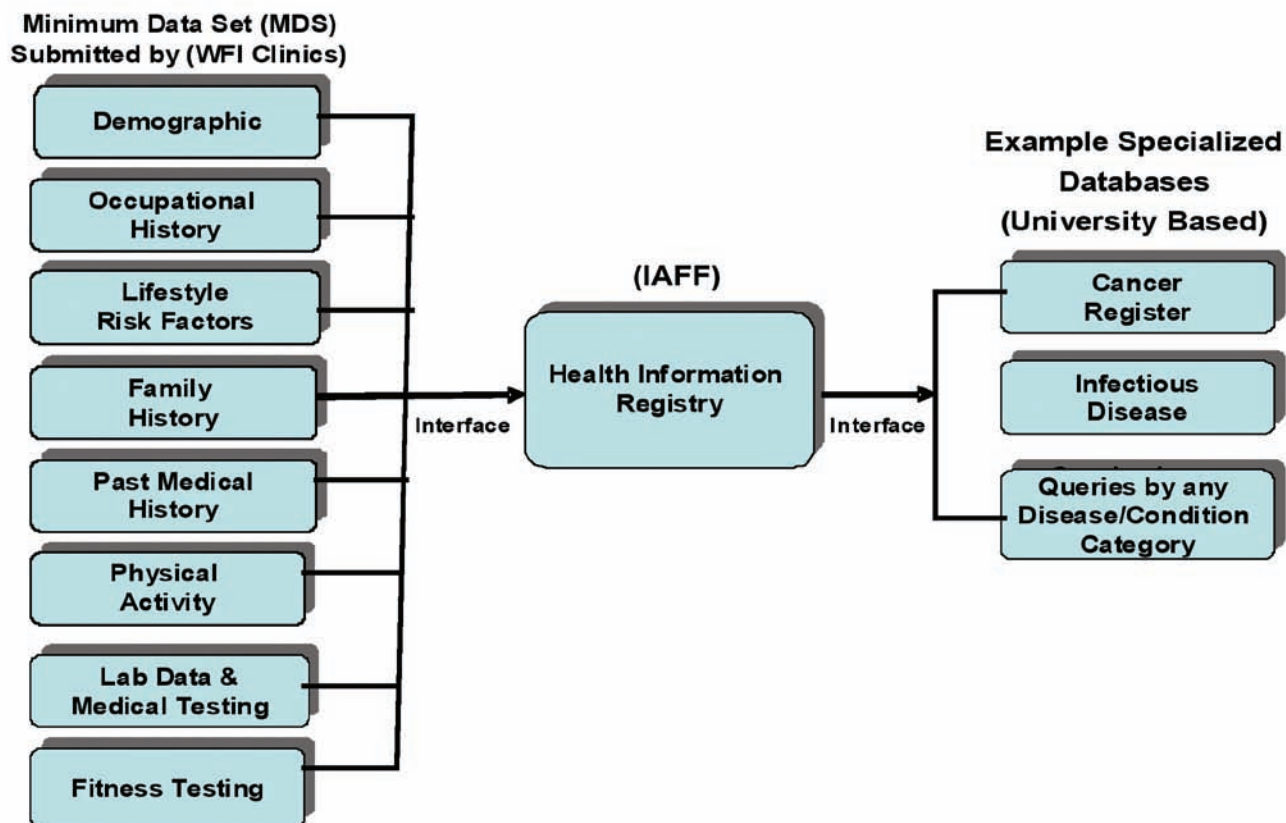
THE BI-FUNCTIONALITY OF THE HIR

The web-based health information registry hosted by the IAFF will be much more than a repository to hold the MDS. Ultimately it will permit the generation of robust and validated epidemiologic data on the health outcomes of fire service members.

To achieve this, the HIR must be able to receive uploaded data from the participating WFI jurisdictions (one functional interface) and be able to down load results of queries made to it —such as report generation on frequency of a specific diagnosis, i.e. tuberculosis— in fire service members (the second functional interface).

This could document health risks (i.e. cancer excesses) in the fire service which could advance legislative or improvement in working conditions initiatives. The grouped data could also be used for health education purposes and to show return on investment for the WFI and other health promoting interventions. ■

Figure 1: Structure of IAFF Health Information Registry



CHAPTER 8 — Implementation

Management and Labor shall work together to fully implement all components of the WFI.

This chapter highlights the following:

- Introduction
- Step-by-Step Process for WFI Implementation
- Sample Documents and Checklists for WFI Implementation
- Agreement Phase
- Implementation and Maintenance
- Considerations for WFI Implementation

The WFI DVD contains additional resource files for use in the implementation of the WFI program. These resource documents are either in Microsoft Word or Microsoft Excel, which will allow users to edit and customize for their fire department.

To view these resource documents, click on the Implementation Resources folder and search for the title. Once you click a document it will open in a separate window. You can then save the file on your computer. After you have finished you must close the document to view another title.

Each subsection of this Chapter notes the applicable file(s) for that particular subject.

INTRODUCTION

This chapter offers a step-by-step approach to implementing the Joint Labor-Management Wellness-Fitness Initiative (WFI). Any fire department can use this process to evaluate a current wellness-fitness program or to design and implement a new program that meets the criteria identified in this Initiative. While various elements and methods of a wellness-fitness program vary from department to department, the program development process will be similar. To assist in this process, sample strategies and worksheets have been included to assist with implementation of the WFI in your organization.

Uniformed personnel who respond to emergency incidents are required to put forth a high level of physical effort. This effort, over time, affects the long-term health and response-readiness of our first responders. The consequences of compromised uniformed personnel health and fitness can result in serious injury and even death. For the past 20 years, annual fire fighter mortality rates have shown that 50 percent of fire fighter fatalities are the result of various forms of heart disease. A 2006 study commissioned by the International Association of Fire Fighters reported similar findings. Between 2000 and 2005, health and fitness-related factors contributed to over 50 percent of fire fighter line-of-

duty deaths. What these statistics indicate is that adverse outcomes facing fire fighters and fire service organizations may be preventable through improvements in the underlying health and fitness of department personnel.

To respond to emergencies safely and effectively and to avoid injuries and recover rapidly, uniformed personnel must possess a high level of physical fitness. This includes aerobic fitness, muscular strength, flexibility and endurance, as well as sound behavioral habits. If significant progress is to be made in the reduction of health-related fire fighter deaths and serious injuries, it is imperative that fire service organizations embrace a comprehensive wellness-fitness program.

A wellness-fitness program that is developed and implemented in accordance with the WFI will help secure the highest possible level of health to fire response personnel. These programs have also been shown to provide the additional benefit of being cost effective, typically by reducing the number of work-related injuries and lost workdays due to injury or illness. This has been found in cities and locals around the country following their implementation of the WFI.

STEP-BY-STEP PROCESS FOR WFI IMPLEMENTATION — DESIGN PHASE

■ Obtain the Wellness-Fitness Initiative (WFI)

Additional copies of the WFI DVD can be obtained by contacting the IAFF or the IAFC at the following addresses:

International Association of Fire Fighters
Division of Occupational Health, Safety, and Medicine
1750 New York Avenue, NW
Washington, DC 20006
202.737.8484
202.737.8418 (Fax)
<http://www.iaff.org>

International Association of Fire Chiefs
4025 Fair Ridge Drive, #300
Fairfax, VA 22033-2868
703.273.0911
202.273.9363 (Fax)
<http://www.iafc.org>

Those involved in the implementation of this program must take the time to review all chapters carefully to become familiar with the general program approach and objectives.

Additional Resources:

- WFI Checklist



■ Establish a Project Team

A project team should be established to develop and implement the program. For the plan to be effective, all members of the organization should feel that they have the opportunity to participate in the implementation process. Therefore, one of the primary responsibilities of the team members will be to communicate with members throughout the organization about the development and implementation of the WFI. Good written and verbal communications skills will be an extremely important aspect of the process. The team should include representation from all areas and ranks within the organization. This should include but not be limited to: the fire department physician or an appropriate health care professional; the department's Wellness Coordinator; and Peer Fitness Trainers (PFT), who will play a major role in the design and implementation of programs. Equal representation from both labor and management will help foster a non-punitive, cooperative environment and equality among department personnel.

Additional Resources

- Sample Flow Chart
- Sample Meeting Guidelines
- Sample MOU/Contract

■ Identify and Compare Elements of the WFI with Established Practices

The fire department's established practices and procedures should be compared to the WFI requirements and recommendations. The WFI has identified specific components to be included as part of an organization's initial assessment. Many organizations will determine that a number of program elements supporting these components are already in place. For example, many departments already have periodic or annual medical evaluations and will not have to add this element as a new component of their wellness-fitness program.

The assessment must also determine if, and how well, an existing or planned program addresses the following key points:

- Confidentiality of medical and fitness evaluations and behavioral programs.
- Development of programs which are educational and rehabilitative.
- Documented commitments by labor and management to a positive, non-punitive, individualized wellness-fitness program.
- Long-term wellness-fitness goals.
- Program elements that could eventually be made available to retirees.
- The primary effort will be directed to identifying areas that will require changes and/or new program elements. The current activities related to each point should be listed and then objectives for new elements should be identified.

Additional Resources:

- Sample Comparison Worksheet

■ Develop Mission Statement, Goals, and Objectives

• **Mission statement:**

A summary description of an entity's purpose that is clear, direct and keeps the fire department and uniformed personnel focused within the scope of the WFI. Statements generally relate to:

- Quality
- Excellence
- Commitment to uniformed personnel
- Department goals
- Compliance with regulations
- Consistency of service and protection
- Providing a service and integrating with community and business sectors

• **Goal:**

An aim or end result of the proposed action, something to be accomplished that will assist the program in moving forward. Goals should be:

- Specific
- Measurable
- Attainable
- Realistic
- Time-bound

• **Objective:**

A specific, measurable statement which specifies the desired immediate or direct outcomes of the proposed program. Remember that your objectives should support your goal (i.e., the accomplishment of objectives leads to the overall accomplishment of goals).

Whether you are writing a grant or selling a program you must know the following before you start:

- **Target:** What is the target population for which the desired outcome is intended?
- **How:** Outline programs or needs required meeting the established goals (e.g., committees, consortiums, contracts, etc)?
- **What:** A clear statement of the behavior changes/results expected.
- **When:** Under what circumstances and what time will the task(s) be completed (e.g., by a given date, after full implementation of the program, etc.)?
- **Action:** Move on to defining the tasks associated with each objective.
- **Benchmarks:** Use baseline measurements to start, and realistic benchmarks for progress. Not all phases of the pro-

gram will have baseline data to start with for hard, quantitative assertions. It is important, however, to adjust goal and objective statements in subsequent years, after baseline and benchmark data become available.

- Measures: In what way will you measure the program's progress (e.g., via surveys, statistics measured against available baseline data)?
- Reports: When requested, be prepared to write a report or summary.

Additional Resources:

- Sample Wellness — Fitness Considerations 

■ Identify Alternative Approaches for each Objective

Alternative approaches for each objective should be identified. The choice will depend on the specific situation that exists within each organization. All of the alternatives need to be evaluated in terms of effectiveness, cost, and the time required for implementation. For some organizations, it may be prudent to consider examining the possibility of developing a joint program with other public safety agencies, either in the same or adjacent jurisdictions, such as police and fire in the same jurisdiction or a regional fire-based program. There may also be other entities, either public or private, in the area that already have a similar program in place due to federal regulations. Nevertheless, the approach chosen by one fire department might not be feasible for another.

■ Develop a Budget

Develop a budget that is based on your long-term goals and objectives. The budget should divide costs into WFI program components or areas and delineate personnel, operating and capital costs per fiscal year. Developing the budget will assist in the planning process and should not be left to the last step. The budget can be divided and implemented in phases.

Additional Resources:

- Blank Time-Line Budget Worksheet 

■ Determine Available Funding

At this time, a determination of available and/or additional funding should be made.

- Work with partners who can provide or share their resources or expertise.
- Consider teaming up with other fire service organizations or a local school or college athletic program.
- Negotiate a group rate with a commercial fitness center that could provide or share services or equipment. Such partnerships can benefit all parties.
- Work with the city, county council or other local governing bodies to secure funding for the program. Many fire departments and cities have established a “matching fund” account in which the city matches each

department contribution with an equal or greater match. The account pays for items such as certification of Peer Fitness Trainers (PFTs), seminars, and exercise equipment.

- Seek out additional information and approaches used by other departments that have successfully reduced or contained implementation costs.
- Grant Funding — For information on fire service grants, visit the following website: www.firegrantsupport.com.

Additional Resources:

- Sample Needs Survey 
- Sample Grant Application 


■ Develop a Budget Justification

One of the major roadblocks in preventing fire departments from implementing the WFI is the perceived cost and concerns about economic benefit. The objective of budget justification is to determine the economic impact by calculating all costs related to disabilities in your organization. For more information on this topic see Chapter 6 on Cost Justification.

■ Prepare a Strategic Plan

The strategic plan must identify how the department intends to meet the objectives of the program. The plan must also present a timeline for phasing in components that will lead to full implementation.

Additional Resources:

- Sample Strategic Agenda 

AGREEMENT PHASE

■ Review of the Strategic Plan

At this point, it is appropriate to conduct a comprehensive review of the drafted strategic plan, obtaining comments and suggestions from all stakeholders. This includes labor and management groups as well as groups from the legal, risk management, finance divisions, and any and others deemed necessary to ensure success of the program.

■ Submit the Strategic Plan for Adoption

After the plan has been finalized, it should be submitted to the authority having jurisdiction for review and discussion. The authority having jurisdiction could be a fire chief, mayor or city manager, city council, town board, or district trustees. Adequate support information should be submitted to identify the need for the program and the goal of achieving specific levels of fire fighter wellness and fitness. The anticipated benefits to the individual members, the fire department, and the community at large should be thoroughly documented.

■ Implement the Strategic Plan

After the concept of the plan has been accepted and approved, the plan should be officially adopted. This may be accomplished through an administrative process, such as

a general order signed by the fire chief, union contract negotiations, memorandum of understanding, or it may require formal adoption through a statute, law, or ordinance. This adoption process should establish a commitment to follow through with the programs, practices, and procedures identified in the strategic plan.

Additional Resources:

- Sample MOU
- Sample Request for Proposal (RFP)

■ Internal Education/Marketing

Educating all parties involved in the process regarding all aspects of the plan is crucial to the success of the program. The information needs to emphasize the benefits and safeguards for uniformed personnel and explain how the program will bring the fire department into compliance with accepted national fire service standards and federal regulations.

Additional Resources:

- Sample Communication Plan

IMPLEMENTATION AND MAINTENANCE

■ Organize Implementation Teams

Once adopted, one or more implementation teams needs to be established to carry out the objectives of the plan. Each team shall be responsible and accountable for implementing specific sections of the plan.

Additional Resources

- Sample Team Meeting Agenda

■ Develop an Implementation Strategy

A common-sense approach should be used when implementing the plan. Each specific element of the plan needs to be integrated in such a way that full accomplishment of the program objectives is ultimately achieved. The implementation strategy should consider the specific circumstances of the individual fire department.

After the implementation strategy has been established, the plan should be implemented. The implementation should follow the step-by-step sequence identified.

Additional Resources:

- Sample Action Plan Worksheet

■ Monitor Progress

After implementation, progress should be regularly reviewed and periodically assessed for possible changes. Standard project management practices should be employed to maintain steady progress toward completing implementation.

Additional Resources:

- Sample Pre-Program Survey

■ Collect Data

It must be emphasized that baseline data collection is essential to future benchmark and comparison data. Often fire departments are quick to implement a program without setting clear baseline data points. The value of future cost-benefit support needs good baseline data. See the chapter on Data Collection for further details.

■ Review and Update the Plan Regularly

It is essential that the plan be reviewed periodically to measure progress, evaluate effectiveness, and ensure that the objectives and assumptions are still valid. The information from program evaluations will help identify program strengths as well as needed improvements. Even the best planned programs may need mid-course or regular modifications or corrections to reflect new information or changing conditions. In addition, information collected through feedback from program participants will provide insight about meeting participant needs and increasing the likelihood of ongoing success. Therefore, appropriate changes or modifications to the plan, which have been approved by the involved parties, must be made in an appropriate and timely manner to maintain the long-term success of the program.

Additional Resources:

- Sample 1-Year Post Survey

CONSIDERATIONS FOR WFI IMPLEMENTATION

1. Identify the purpose.
2. Identify the key stakeholders.
3. Hold a meeting to create a strategic plan.
 - a. Describe the reasons for developing the wellness-fitness program (or enhancing an existing program), including regulatory issues, wellness-fitness needs of fire fighters, and roles/responsibilities of the department.
 - b. Describe the components and goals of the wellness-fitness program (e.g., use the IAFF/IAFC Joint Labor Management WFI materials for specifics and guidance; inquire about successful programs or strategies at other departments for additional ideas).
 - c. Identify action items and steps needed to come into compliance, and determine what can be accomplished in the short-term versus long-term (see step 4 below on completing a needs assessment).
 - d. Develop a process and timeline for each step or goal. Break down this process into manageable tasks.
 - e. Develop an action plan and make assignments (depending on department size and resources, working committees or subcommittees may be formed).
 - f. Identify a process for approval or consensus by the key stakeholders, as needed.

4. Complete a needs assessment.
 - a. Identify and review existing plans/programs — Does the department have a wellness-fitness program currently in place? If so, what is the status of the current program? Which components and concepts of the WFI have already been incorporated?
 - b. Identify existing equipment and resources.
 - c. Identify gaps and needs (equipment, staff, funding).
 - d. What is needed to comply with key regulations and standards (NIOSH, OSHA, NFPA)?
 - e. Identify and address obstacles.
 - f. Identify and address any liability and insurance issues associated with the program.
 - g. Identify existing and potential funding sources.
5. Market the effort, identifying the benefits to program participants and stakeholders.
 - a. Publicize and inform (e.g., emails, newsletters, periodic meetings).
 - b. Use of data to justify expense (workers comp statistics, lost time injury tracking, etc.)
 - c. Identify and recruit advocates from each stakeholder group to help promote the program.
6. Program development.
 - a. Describe the purpose, rationale, and primary/shared goal(s) of the program.
 - b. Key elements and concepts to build a plan.
 - i. Scope of plan — Include components identified in the WFI; identify components to be offered through the department and externally (e.g., commercial or other local fitness facilities); and any testing, evaluation, and/or follow-up measures to track wellness-fitness improvements and program progress and successes.
 - ii. Identify partners and their role in the program.
 - iii. Identify funding mechanism(s); develop a funding plan.
7. Circulate the proposed plan to the stakeholders and finalize.
8. Roll out/implement program.
 - a. Publicize, inform, and educate.
 - b. Collect initial feedback.
 - c. Continue to inform, educate, and motivate through a variety of media (e.g., newsletters, emails, in-station classes. Consider rotating activities and training options available to participants.
9. Periodically review, evaluate, and update the program.
 - a. Develop a method and timetable for program review and revision.
 - b. Collect feedback from participants and other stakeholders (informal and/or formal commentary as needed or planned).
 - c. Collect data per recommended guidelines.
 - d. Revise and update the program as needed.
 - e. In seeking to achieve full compliance, re-assess resources and program/department infrastructure and support to incorporate additional components of the WFI.

Additional Resources:

- Sample Large Dept. Re-Org Budget Request ■





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APPENDIX A — Fitness Protocols

WFI FITNESS Assessments

OVERVIEW

Five components of fitness are being evaluated to determine a baseline level of fitness for fire service personnel and to measure progress from year to year. The five components are: Body Composition, Aerobic Capacity, Muscular Strength, Muscular Endurance, and Flexibility. Fitness assessments may be conducted by the designated fire department's certified fitness personnel. All data collected by the evaluator shall be maintained in a secure location and adhere to strict levels of confidentiality.

1. Body Composition: Skinfold measurements

There are many techniques available to estimate body composition. The WFI recommends a three-site skinfold measurement to estimate body composition. When performed correctly, skinfold measurements yield reliable, accurate, and cost-effective estimates with a standard error of $\pm 3.5\%$.

2. Aerobic Capacity: WFI Treadmill/WFI Stepmill

There are many assessments currently available to evaluate aerobic capacity. The WFI recommends two submaximal tests to predict maximum aerobic capacity, the WFI Treadmill Protocol and the WFI Stepmill Protocol. The formula for calculating the heart rate limit, or Target Heart Rate (THR), has been modified. In order to determine THR for these assessments refer to Table 5.5.

A maximal aerobic capacity test can also be used to obtain maximal VO₂ values. This protocol shall only be conducted in a medical facility under the supervision of a physician, including, ECG monitoring and resuscitation equipment.

3. Muscular Strength: Hand Grip, Static Arm, & Static Leg

There are many assessments currently available to evaluate maximum muscular strength. The WFI recommends isometric tests because they are reliable, valid, cost-effective, portable, easy to administer and safe. As with all forms of exercise there are inherent risks for injury; however, with comprehensive pre-screening, appropriate instruction, supervision, and proper execution, the risks are minimized.

Vertical Jump (Optional)

The Vertical Jump can be used as a substitute for the static leg strength evaluation. Some participants are apprehensive about the static leg dynamometer, despite the emphasis on prescreening, instruction, supervision and proper execution. This assessment may be offered as an alternative, but is not directly comparable to the results of static leg dynamometer. The static leg assessment evaluates muscular strength, which is only one component of power. The vertical jump employs a formula to calculate power, or the force produced by the legs to propel the body upward.

4. Muscular Endurance: Push-ups & Prone Static Plank

There are many protocols currently available to assess muscular endurance. The WFI recommends a combination of static and dynamic movements for evaluating muscular endurance, the prone static plank and push-ups.

Alternate Grip Push-up (Optional)

The alternate grip push-up (with stands) is an optional test for participants who experience muscular/skeletal discomfort in the performance of the standard WFI push-up. When utilizing the push-up handles, the height of the standard 5-inch range-of-motion prop must be adjusted to five inches, plus the height of the handles.

5. Flexibility: Sit & Reach

There are many protocols currently available to measure flexibility. The WFI recommends the modified sit-and-reach assessment which is used to assess gross posterior muscle flexibility. This evaluation adjusts for the differences in limb length among participants.

Equipment

All evaluation equipment must be as specified in these protocols. Equipment must not be substituted unless otherwise indicated. All equipment must be maintained and properly calibrated in accordance with the manufacturer's instructions. Failure to do so may result in inaccurate or invalid data.

The WFI fitness assessment protocols, and the equipment needed to perform them, are described below:

BODY COMPOSITION

- Lange Skinfold Calipers or equivalent
- Flexible tape measure
- Water-soluble marker

AEROBIC CAPACITY

- Treadmill - The treadmill shall be a commercial treadmill capable of obtaining a minimum of 15% grade and 10 mph.
- Heart Rate Monitor
- Stopwatch
- Stepmill - The Stepmill should be a StairMaster 7000PT. Many generations of the Stepmill have been manufactured over the years. Consequently, the steps/min rate varies from model to model. The new WFI test was validated on a unit that has 20 intensity levels. It is imperative that the administrator insure that the unit is calibrated to the same steps-per-minute rate for each level indicated in the testing protocol. Refer to Table 5.0

Table 5.0
Intensity (steps/min) for each level on the Stepmill

Level	Steps/min	Level	Steps/min
1	24	11	97
2	31	12	104
3	39	13	111
4	46	14	118
5	53	15	126
6	60	16	133
7	65	17	140
8	75	18	147
9	82	19	155
10	89	20	162

Note: If your Stepmill is not calibrated to the same steps/min rate as the 20-level table, the test may be invalid for your Stepmill. Please refer to the manufacturer for options.

MUSCULAR STRENGTH

- Hand-Grip Dynamometer - Hand grip strength evaluations are performed with the JAMAR Hydraulic Hand dynamometer.
- Arm Dynamometer - The arm dynamometer shall be the Jackson Strength Evaluation System or a commercial dynamometer that includes an adjustable chain, handle bar, and test platform. The assessor must verify that the dynamometer is equivalent to the Jackson Strength Evaluation System.
- Leg Dynamometer - The leg dynamometer shall be the Jackson Strength Evaluation System or a commercial dynamometer system that includes an adjustable chain, and test platform. The assessor must verify that the dynamometer is equivalent to the Jackson Strength Evaluation System. A V-grip handlebar, or “chinning triangle,” is required.
- Vertical Jump (Optional) - The vertical jump shall be evaluated using a timing mat to estimate the vertical distance traveled. The timing mat shall be the “Just Jump” mat from Probotics or other commercial timing mat. If an alternative device is used, the test administrator must verify that the device is equivalent to the Probotics “Just jump” mat.

MUSCULAR ENDURANCE

- Static Plank - The static plank requires an exercise mat and a stopwatch.
- Push-up - The push-up evaluation requires a five-inch prop (e.g., cup, sponge), a metronome and a stopwatch. An exercise mat is optional.
- Alternate Grip Push-up (optional) - The alternate grip push-up requires a range-of-motion prop (e.g., cup, sponge), a metronome, stopwatch; and push-up stands or two 40 lb. hex dumbbells. Note: The range of motion prop shall be modified to ensure that the height is five inches, plus the height of the stands (e.g., a pair of five-inch push-up stands will require a ten-inch prop).

FLEXIBILITY

- Sit-and-Reach – The equipment required is a Novel Acuflex I or equivalent trunk flexibility test device that compensates for variable arm and leg lengths.

MANDATORY PRE-EVALUATION PROCEDURE

All personnel shall be medically cleared within the last 12 months prior to participating in the WFI assessments.

All personnel shall be health screened prior to conducting the WFI assessments (e.g., Par-Q, Health History).

Assessments shall be deferred if the following medical conditions exist:

- Chest pain, during or in the absence of physical activity
- Recent unexplained loss of consciousness
- Loss of balance due to dizziness (ataxia)
- Recent injury resulting in bone, joint or muscle problems that may be exacerbated by exercise
- Current prescribed drug that inhibits physical activity
- Chronic infectious disease (e.g., hepatitis)
- Pregnancy
- Any other reason the participant believes that he or she should not be physically evaluated

The following pre-evaluation procedure shall be conducted for all personnel prior to conducting fitness assessments:

- Obtain a resting heart rate and blood pressure. If resting heart rate is equal to or greater than 110 beats per minute and/or resting blood pressure is equal to or greater than 160/100 mm Hg, instruct the participant to rest for five minutes and re-evaluate. If the heart rate and/or blood pressure remain at these levels, cancel the fitness evaluation and refer the participant to the fire department physician. If the heart rate and/or blood pressure fall within the acceptable range, the assessment may continue.

The assessor shall:

- Instruct the participants to refrain from eating, drinking, smoking and any physical activity that may influence performance prior to the assessment. Activities that affect heart rate and/or blood pressure measurements may adversely impact performance.
- Assure that participants are wearing appropriate attire.
- Record participants' age.
- Inform participants of the appropriate execution for each protocol.

ASSESSMENT SEQUENCE

The assessments are sequenced to minimize the effect of fatigue on subsequent performance, and to mitigate injury. The WFI requires that assessments be performed in the following sequence:

1. Body composition
2. Aerobic capacity
3. Muscular strength/power
4. Muscle endurance
5. Flexibility

Note: Personnel should have the opportunity to recover from the previous assessment before proceeding to the next.

INDICATIONS FOR STOPPING EVALUATION

- Onset of angina or angina-like symptoms
- Signs of poor perfusion: light-headedness, confusion, ataxia, poor pallor, cyanosis, nausea, or cold, clammy skin
- Failure of heart rate to increase with increase in exercise intensity
- Participant requests evaluation to stop
- Physical or verbal manifestations of severe fatigue
- Joint or muscle pain that becomes aggravated with exercise
- Failure of the testing equipment

WFI ASSESSMENT PROTOCOLS: BODY COMPOSITION

EQUIPMENT

- Lange Skinfold Calipers or equivalent
- Flexible tape measure
- Water-soluble marker

ASSESSMENT

- Conduct pre-evaluation procedures.
- Obtain the participant's age.
- Note the gender-specific skinfold sites. Men are measured at the triceps, subscapular and pectoral sites; women are measured at the triceps, abdominal and suprailiac sites.
- All measurements should be made on the right side of the body, with the subject standing upright.
- Use the tape measure to mark the site to be measured with a water-soluble marker.
- Place calipers directly on the skin surface, 1 cm away from the thumb and finger; perpendicular to the skinfold; and halfway between the crest and base of the fold.
- Maintain pinch while reading the caliper.
- Wait 1 – 2 seconds (not longer,) before reading caliper.
- Rotate through all three sites or allow time for skin to regain normal texture and thickness.
- Take two measurements at each site. If the values are less than 1 millimeter of each other then calculate the average of the two measurements.
- If the difference between the two measurements is greater than or equal to 1 millimeter, then a third measurement must be taken.

If the differences between the three skinfold measurements are equal, then calculate the average of all three measurements. [e.g., (1) 6 mm, (2) 9mm, (3) 12 mm the average of all three measurements is 9 mm.]

If the three measurements are **not** equal distance apart then calculate the average of the two closest measurements. [e.g., (1) 7mm, (2) 4 mm, (3) 5 mm the average is calculated for measurement #2 and #3 only. The average of the two measurements is 4.5 mm.]

Once the skinfolds are collected for all three sites, calculate the sum of the average skinfold measurement for each site. (Note: Sites are specific to gender.)

To determine body fat percentage, cross-reference the sum of skin folds with the subject's age on the appropriate chart provided in this section (male - table 5.1; female – table 5.2).

MALE SKINFOLD SITES

- **Triceps** – located at the midpoint between the acromio-clavicular (AC) joint and the olecranon process (center of the elbow) on the posterior aspect of the upper arm.

Figure 5.0



Figure 5.1



- **Subscapular** - located on the same diagonal line as the inferior border of the scapula, 2cm beyond the inferior angle.

Figure 5.2



Figure 5.3



- **Pectoral** – Located on a diagonal line, midway between the axillary fold and the right nipple.

Figure 5.4



Figure 5.5



FEMALE SKINFOLD SITES

- **Triceps** – located at the midpoint between the acromio-clavicular (AC) joint and the olecranon process (center of the elbow) on the posterior aspect of the upper arm.

Figure 5.6



Figure 5.7



- **Abdominal** – located at the right of the umbilicus, on a vertical fold, 2cm from the right lateral border.

Figure 5.8



Figure 5.9



- **Suprailiac** – located on a diagonal line, 1-2 cm anterior to the crest of the pelvis (ASIS). Grasp a diagonal skin-fold just above and slightly forward of the crest of the Ilium.

Figure 5.10



Figure 5.11



Table 5.1
Percentage of Body Fat estimate for **MEN**
Based on the Sum of Triceps, Subscapular, and Pectoral Skinfolde

Skinfolde Sum (mm)	Age up to Last Complete Year								
	Under 22	23 - 27	28 - 32	33 - 37	38 - 42	43 - 47	48 - 52	53 - 57	Over 57
8 - 10	1.5	2.0	2.5	3.1	3.6	4.1	4.6	5.1	5.6
11 - 13	3.0	3.5	4.0	4.5	5.1	5.6	6.1	6.6	7.1
14 - 16	4.5	5.0	5.5	6.0	6.5	7.0	7.6	8.1	8.6
17 - 19	5.9	6.4	6.9	7.4	8.0	8.5	9.0	9.5	10.0
20 - 22	7.3	7.8	8.3	8.8	9.4	9.9	10.4	10.9	11.4
23 - 25	8.6	9.2	9.7	10.2	10.7	11.2	11.8	12.3	12.8
26 - 28	10.0	10.5	11.0	11.5	12.1	12.6	13.1	13.6	14.2
29 -31	11.2	11.8	12.3	12.8	13.4	13.9	14.4	14.9	15.5
32 - 34	12.5	13.0	13.5	14.1	14.6	15.1	15.7	16.2	16.7
35 - 37	13.7	14.2	14.8	15.3	15.8	16.4	16.9	17.4	18.0
38 - 40	14.9	15.4	15.9	16.5	17.0	17.6	18.1	18.6	19.2
41 - 43	16.0	16.6	17.1	17.6	18.2	18.7	19.3	19.8	20.3
44 - 46	17.1	17.7	18.2	18.7	19.3	19.8	20.4	20.9	21.5
47 - 49	18.2	18.7	19.3	19.8	20.4	20.9	21.4	22.0	22.5
50 - 52	19.2	19.7	20.3	20.8	21.4	21.9	22.5	23.0	23.6
53 - 55	20.2	20.7	21.3	21.8	22.4	22.9	23.5	24.0	24.6
56 - 58	21.1	21.7	22.2	22.8	23.3	23.9	24.4	25.0	25.5
59 - 61	22.0	22.6	23.1	23.7	24.2	24.8	25.3	25.9	26.5
62 - 64	22.9	23.4	24.0	24.5	25.1	25.7	26.2	26.8	27.3
64 - 67	23.7	24.3	24.8	25.4	25.9	26.5	27.1	27.6	28.2
68 - 70	24.5	25.0	25.6	26.2	26.7	27.3	27.8	28.4	29.0
71 - 73	25.2	25.8	26.3	26.9	27.5	28.0	28.6	29.1	29.7
74 - 76	25.9	26.5	27.0	27.6	28.2	28.7	29.3	29.9	30.4
77 - 79	26.6	27.1	27.7	28.2	28.8	29.4	29.9	30.5	31.1
80 - 82	27.2	27.7	28.3	28.9	29.4	30.0	30.6	31.1	31.7
83 - 85	27.7	28.3	28.8	29.4	30.0	30.5	31.1	31.7	32.3
86 - 88	28.2	28.8	29.4	29.9	30.5	31.1	31.6	32.2	32.8
89 - 91	28.7	29.3	29.8	30.4	31.0	31.5	32.1	32.7	33.3
92 -94	29.1	29.7	30.3	30.8	31.4	32.0	32.6	33.1	33.4
95 - 97	29.5	30.1	30.6	31.2	31.8	32.4	32.9	33.5	34.1
98 - 100	29.8	30.4	31.0	31.6	32.1	32.7	33.3	33.9	34.4
101 - 103	30.1	30.7	31.3	31.8	32.4	33.0	33.6	34.1	34.7
104 - 106	30.4	30.9	31.5	32.1	32.7	33.2	33.8	34.4	35.0
107 - 109	30.6	31.1	31.7	32.3	32.9	33.4	34.0	34.6	35.2
110 - 112	30.7	31.3	31.9	32.4	33.0	33.6	34.2	34.7	35.3
113 - 115	30.8	31.4	32.0	32.5	33.1	33.7	34.3	34.9	35.4
116 - 118	30.9	31.5	32.0	32.6	33.2	33.8	34.3	34.9	35.5

Table 5.2
Percentage of Body Fat estimates for **WOMEN**
Based on the Sum of Triceps, Abdominal, and Suprailiac Skinfolds

Skinfolds	Age up to Last Complete Year								
Sum (mm)	18 - 22	23 - 27	28 - 32	33 - 37	38 - 42	43 - 47	48 - 52	53 - 57	Over 57
8 - 12	8.8	9.0	9.2	9.4	9.5	9.7	9.9	10.1	10.3
13 - 37	10.8	10.9	11.0	11.3	11.5	11.7	11.8	12.0	12.2
18 - 22	12.6	12.8	13.0	13.2	13.4	13.5	13.7	13.9	14.1
23 - 27	14.5	14.6	14.8	15.0	15.2	15.4	15.6	15.7	15.9
28 - 32	16.2	16.4	16.6	16.8	17.0	17.1	17.3	17.5	17.7
33 - 37	17.9	18.1	18.3	18.5	18.7	18.9	19.0	19.2	19.4
38 - 42	19.6	19.8	20.0	20.2	20.3	20.5	20.7	20.9	21.1
43 - 47	21.2	21.4	21.6	21.8	21.9	22.1	22.3	22.5	22.7
48 - 52	22.8	22.9	23.1	23.3	23.5	23.7	23.8	24.0	24.2
53 - 57	24.2	24.4	24.6	24.8	25.0	25.2	25.3	25.5	25.7
58 - 62	25.7	25.9	26.0	26.2	26.4	26.6	26.8	27.0	27.1
63 - 67	27.1	27.2	27.4	27.6	27.8	28.0	28.2	28.3	28.5
68 - 72	28.4	28.6	28.7	28.9	29.1	29.3	29.5	29.7	29.8
73 - 77	29.6	29.8	30.0	30.2	30.4	30.6	30.7	30.9	31.1
78 - 82	30.9	31.0	31.2	31.4	31.6	31.8	31.9	32.1	32.3
83 - 87	32.0	32.2	32.4	32.6	32.7	32.9	33.1	33.3	33.5
88 - 92	33.1	33.3	33.5	33.7	33.8	34.0	34.2	34.4	34.6
93 - 97	34.1	34.3	34.5	34.7	34.9	35.1	35.2	35.4	35.6
98 - 102	35.1	35.3	35.5	35.7	35.9	36.0	36.2	36.4	36.6
103 - 107	36.1	36.2	36.4	36.6	36.8	37.0	37.2	37.3	37.5
108 - 112	36.9	37.1	37.3	37.5	37.7	37.9	38.0	38.2	38.4
113 - 117	37.8	37.9	38.1	38.3	39.2	39.4	39.6	39.8	39.2
118 - 122	38.5	38.7	38.9	39.1	39.4	39.6	39.8	40.0	40.0
123 - 127	39.2	39.4	39.6	39.8	40.0	40.1	40.3	40.5	40.7
128 - 132	39.9	40.1	40.2	40.4	40.6	40.8	41.0	41.2	41.3
133 - 137	40.5	40.7	40.8	41.0	41.2	41.4	41.6	41.7	41.9
138 - 142	41.0	41.2	41.4	41.6	41.7	41.9	42.1	42.3	42.5
143 - 147	41.5	41.7	41.9	42.0	42.2	42.4	42.6	42.8	43.0
148 - 152	41.9	42.1	42.3	42.8	42.6	42.8	43.0	43.2	43.4
153 - 157	43.3	42.5	42.6	42.8	43.0	43.2	43.4	43.6	43.7
158 - 162	42.6	42.8	43.0	43.1	43.3	43.5	43.7	43.9	44.1
163 - 167	42.9	43.0	43.2	43.4	43.6	43.8	44.0	44.1	44.3
168 - 172	43.1	43.2	43.4	43.6	43.8	44.0	44.2	44.3	44.5
173 - 177	43.2	43.4	43.6	43.8	43.9	44.1	44.3	44.5	44.7
178 - 182	43.3	43.5	43.7	43.8	44.0	44.2	44.4	44.6	44.8

WFI AEROBIC CAPACITY EVALUATIONS

There are two submaximal assessments to determine a fire fighter's aerobic capacity: the WFI submaximal treadmill and the WFI sub-maximal Stepmill. Using the calculations provided in the respective section, both assessments estimate a fire fighter's maximal aerobic capacity, expressed as VO_2 max. Either the treadmill or Stepmill can be used as long as the results are calculated using the appropriate assessment formula. All aerobic capacity evaluation results must be recorded in milliliters (ml) of oxygen per kilogram (kg) of body weight per minute (VO_2 max).

These aerobic assessments are submaximal and are based on the heart rate response during graded exercise. Accurate estimation of maximal heart rate (MHR) is critical to the submaximal prediction used in these assessments. A new formula for calculating maximal heart rate is utilized with these protocols, because it more accurately accounts for age-related reduction of MHR than did the previous formula (Table 5.5). Be aware that the heart rate can be affected by variables such as body temperature, hydration state, anxiety, stress and medications. In addition to heart rate, body mass (height-to-weight ratio), is also a significant variable in both prediction equations. The relationship between height and weight is recorded as Body Mass Index (BMI). It is important to note that BMI is not being used in these aerobic protocols to estimate body composition; but rather, is used to represent the mass of each participant. Whereas all predictive tests are subject to varying degrees of error, it is believed that these new changes will provide vast improvements from previous protocols in reliability, validity and accuracy in estimating VO_2 max.

PRE-EVALUATION PROCEDURES

Choose the aerobic capacity protocol and worksheet.

Measure the participant's:

- Resting heart rate
- Resting blood pressure
- Age
- Height
- Weight
- Gender

- Determine the participants Body Mass Index (BMI) Refer to Table 5.3 & Table 5.4
- Determine the Target Heart Rate (THR). Refer to table 5.5 to determine the appropriate exercise heart rate for the participant's age.
- Record the target exercise heart rate on the protocol worksheet.
- Inform the participant of all evaluation components. Ensure that the participant is in proper clothing and footwear.
- Review all indicators for stopping the evaluation with the participant.

Secure heart rate monitor transmitter around the participant's chest in accordance with the manufacturer's instructions. Evaluator shall hold or wear the heart rate monitor wrist receiver.

Table 5.3

Body Mass Index (BMI) formulas

Metric:	US:
$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$	$\text{BMI} = 703 \times \frac{\text{Weight (lb)}}{\text{Height (in)}^2}$

Table 5.4 Body Mass Index (BMI) Conversion Table

BMI	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Height	BodyWeight(pounds)																														
58" (4'10")	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239
59" (4'11")	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247
60" (5')	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255
61" (5'1")	105	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264
62" (5'2")	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273
63" (5'3")	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282
64" (5'4")	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291
65" (5'5")	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300
66" (5'6")	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309
67" (5'7")	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319
68" (5'8")	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328
69" (5'9")	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338
70" (5'10")	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348
71" (5'11")	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358
72" (6')	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368
73" (6'1")	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378
74" (6'2")	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389
75" (6'3")	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399
76" (6'4")	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410
BMI	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

Table 5.5
Target Heart Rate for Respective Age

Age (yrs)	THR (BPM)	Age (yrs)	THR (BPM)	Age (yrs)	THR (BPM)	Age (yrs)	THR (BPM)
18	166	29	160	40	153	51	146
19	165	30	159	42	152	52	146
20	165	31	158	42	152	53	145
21	164	32	158	43	151	54	145
22	164	33	157	44	151	55	144
23	163	34	157	45	150	56	143
24	163	35	156	46	149	57	143
25	162	36	155	47	149	58	142
26	161	37	155	48	148	59	142
27	161	38	154	49	148	60	141
28	160	39	154	50	147	61	140
THR Formula: $[208 - (0.7 \times \text{age})] \times 0.85$							

WFI AEROBIC CAPACITY EVALUATIONS

TREADMILL EVALUATION

Equipment

- Commercial Grade Treadmill
- Calculator
- Stopwatch
- Heart Rate Monitor
- Height Scale
- Weight Scale

Figure 5.12



TREADMILL EVALUATION

ASSESSMENT

The purpose of this assessment is to estimate the VO₂ max of each participant.

1. Conduct Pre-Evaluation Procedures.
2. The participant straddles the treadmill belt until it begins to move. When the treadmill reaches approximately 1 mph, instruct the participant to step onto the belt. Then increase the speed to 3 mph at 0% grade. Monitor the participant's heart rate continuously throughout the assessment.

Figure 5.12

Time	Speed mph	%Grade
0:00 - 1:00	3.0	0
1:01 - 2:00	3.0	0
2:01 - 3:00	3.0	0
3:01 - 4:00	4.5	0
4:01 - 5:00	4.5	2
5:01 - 6:00	5.0	2
6:01 - 7:00	5.0	4
7:01 - 8:00	5.5	4
8:01 - 9:00	5.5	6
9:01 - 10:00	6.0	6
10:01 - 11:00	6.0	8
11:01 - 12:00	6.5	8
12:01 - 13:00	6.5	10
13:01 - 14:00	7.0	10
14:01 - 15:00	7.0	12
15:01 - 16:00	7.5	12
16:01 - 17:00	7.5	14
17:01 - 18:00	8.0	14
Recovery Phase		
0:00 - 1:00	3.0	0
1:01 - 2:00	3.0	0
2:01 - 3:00	3.0	0

3. Start the stopwatch when the treadmill reaches 3 mph at 0% grade. Continue with this speed and grade for 3 minutes (steady state).
4. After completing the 3-minute steady state interval, inform the participant that the speed will increase to 4.5 mph.
5. Advise the participant that the assessment is a series of 1-minute intervals, alternating between speed and percent grade. All subsequent speed increases occur at 0.5 mph.
6. At 4:01 minutes, increase the grade from 0% to 2%. At this time, inform the participant that all subsequent grade increases occur at 2% intervals.
7. The assessment will continue until the participant's heart rate exceeds the THR rate for 15 seconds, or the subject exhibits the medical criteria for early termination.
8. Once the heart rate exceeds the Target Heart Rate (THR), note the time and continue the assessment for an additional 15 seconds. Do not make any changes to the assessment speed or grade during this time. If the participant's heart rate remains above the THR for the full 15 seconds, then stop the assessment and proceed to the cool-down phase. Record the total time, including the 3-minute warm-up, at which point the participant exceeds the THR. If the participant's heart rate exceeds the target, but then drops back to the THR or below within 15 seconds, then the assessment should continue.

The assessment is not complete until the participant's heart rate exceeds the THR for 15 seconds. If this does not occur within 18 minutes, then terminate the assessment and record the time.

9. Once the assessment is completed, the time is recorded. The participant should perform a cool-down for a minimum of 3 minutes at 3 mph, 0% grade. Continue to monitor the heart rate during the cool-down. Record the recovery heart rate at 1 minute of cool-down.

TERMINATE THE ASSESSMENT IF ANY OF THE FOLLOWING OCCURS:

- a. The THR is exceeded for 15 seconds.
 - b. The THR has not been met after 18 minutes.
 - c. The participant asks to terminate the exercise.
 - d. The equipment malfunctions.
 - e. Medical conditions arise that prohibit completing the assessment.
- Record the reason for terminating the assessment and the initial time the THR was exceeded (if applicable). Record time in minutes and convert second(s) into decimal. See Treadmill Formula and Table 5.6
 - Use the test time (TT) the participant completed the assessment (i.e. exceeded the THR) along with the treadmill conversion formula to estimate VO₂ max.
 - Record the VO₂ max.

Treadmill Sub-maximal VO₂ Prediction Formula

$$\text{VO}_2\text{max} = 56.981 + (1.242 \times \text{TT}) - (0.805 \times \text{BMI})$$

*Note: TT is the time in minutes that the participant's THR was exceeded and the test terminated

Table 5.6
Seconds converted to decimal

Time seconds	Decimal Equivalent	Time seconds	Decimal Equivalent	Time seconds	Decimal Equivalent
1	0.02	21	0.35	41	0.68
2	0.03	22	0.37	42	0.70
3	0.05	23	0.38	43	0.72
4	0.07	24	0.40	44	0.73
5	0.08	25	0.42	45	0.75
6	0.10	26	0.43	46	0.77
7	0.12	27	0.45	47	0.78
8	0.13	28	0.47	48	0.80
9	0.15	29	0.48	49	0.82
10	0.17	30	0.50	50	0.83
11	0.18	31	0.52	51	0.85
12	0.20	32	0.53	52	0.87
13	0.22	33	0.55	53	0.88
14	0.23	34	0.57	54	0.90
15	0.25	35	0.58	55	0.92
16	0.27	36	0.60	56	0.93
17	0.28	37	0.62	57	0.95
18	0.30	38	0.63	58	0.97
19	0.32	39	0.65	59	0.98
20	0.33	40	0.67	60	1.00

Example of the computations required to calculate VO₂ max:

Age: 48 yrs

Weight: 221 lbs

Height: 6'

BMI = 30

THR = 148 bpm

Example Scenario:

At 7 minutes and 32 seconds the participant exceeds their THR. They continue with the assessment for the additional 15 second monitoring period. The HR remained above their THR. Test terminated and time recorded at 7min 32 sec.

Using Table 5.6 convert 32 seconds to decimal = .53

7 min + .53 = test time 7.53

Calculate VO₂ using treadmill formula:

$$\text{VO}_2 = 56.981 + (1.242 \times \text{time}) - (0.805 \times \text{BMI})$$

$$\text{VO}_2 = 56.981 + (1.242 \times 7.53) - (0.805 \times 30)$$

$$\text{VO}_2 = 56.853 + 9.35 - 24.15$$

$$\text{VO}_2 = 42.1$$

STEPMILL EVALUATION

Equipment

- StairMaster 7000 PT Stepmill
- Heart Rate Monitor
- Stopwatch
- Height/Weight Scale
- Calculator

Stepmill Evaluation

Figure 5.13



ASSESSMENT

The purpose of this assessment is to estimate the VO_2 max of each participant.

- Conduct Pre-Evaluation Procedures.
- Monitor the participant's heart rate continuously throughout the assessment.
- Instruct the participant to temporarily grasp the handrails to reduce the possibility of losing balance when the stairs begin to move.
- The starting position is approximately two-thirds of the way up the stairs.
- The assessment starts at level 4 for 2 minutes, then level 5 for 1 minute (warm-up period). Start the stopwatch once the Stepmill begins. Inform the participant that the evaluation is a series of 1-minute intervals with increasing work loads on each subsequent minute.
- Once the assessment commences, do not allow the participant to hold or lean on the handrails; this will result in overestimation of aerobic capacity.
- At the completion of the 3 minute-warm-up, proceed to level 7 for 1 minute. *Note: This is marked by increasing the workload from level 5 to level 7.
- Once the heart rate exceeds the Target Heart Rate (THR), note the time and continue the assessment for an additional 15 seconds. Do not make any changes to the assessment intensity level during this time. If the participant's heart rate remains above the THR for the

Time	Level	Step/min
0:00 – 1:00	4	46
1:01 – 2:00	4	46
2:01 – 3:00	5	53
3:01 – 4:00	7	65
4:01 – 5:00	8	75
5:01 – 6:00	9	82
6:01 – 7:00	10	89
7:01 – 8:00	11	97
8:01 – 9:00	12	104
9:01 – 10:00	13	111
10:01 – 11:00	14	118
11:01 – 12:00	15	126
12:01 – 13:00	16	133
13:01 – 14:00	17	140
14:01 – 15:00	18	147
15:01 – 16:00	19	155
Recovery Phase		
0:00 – 1:00	3	39
1:01 – 2:00	3	39

full 15 seconds, then the participant has completed the assessment. Stop the assessment and record the time at which the participant exceeded the THR. The total Test Time (TT) begins from the time the participant starts on the Stepmill, to the point at which the participant exceeds their THR. It does not include the final 15 second monitoring period that the heart rate was above the THR.

- The assessment is complete once the participant's heart rate exceeds the target for 15 seconds. If the participant's heart rate exceeds the target, but then drops down to the THR or below within 15 seconds, then the assessment should continue.
- Once the assessment is completed, the participant will cool down for a minimum of 2 minutes at level 3. Continue to monitor the heart rate during the cool-down. Record the recovery heart rate at one minute of cool-down. The participant may grasp the handrails during the cool-down phase.
- Upon completion of the cool-down, instruct the participant to grasp the handrails. Stop the stepmill and assist the participant off the apparatus.

**TERMINATE THE ASSESSMENT IF
ANY OF THE FOLLOWING OCCURS:**

- The participant's heart rate exceeds THR for 15 seconds.
- The THR has not been met after 16 minutes.
- The participant asks to terminate the exercise.
- The equipment malfunctions.
- Medical conditions arise that prohibit completing the assessment.
- Record the reason for terminating the assessment and the initial time the heart rate had been exceeded (if applicable). Record time in minutes and convert second(s) into decimal. See Table 5.6
- Insert the test time (TT) at which the participant completed the assessment, along with the stepmill conversion formula to estimate VO_2 max.
- Record the VO_2 max.

Stepmill Sub-maximal VO_2 Prediction Formula

$$\text{VO}_2\text{max} = 57.774 + (1.757 \times \text{TT}) - (0.904 \times \text{BMI})$$

*Note: TT is the time in minutes that the participant's THR was exceeded and the test terminated

The following example illustrates the computations required to calculate VO_2 max for the stepmill.

Age: 48 yrs Weight: 221 lbs Height: 6'
BMI = 30 THR = 148 bpm

Example Scenario:

At 5 minutes and 8 seconds the participant exceeds THR. Continue with the assessment for the additional 15 second monitoring period. If after 10 seconds of monitoring, the participant's heart rate drops below the THR, the appropriate course of action is to continue with the assessment as if the participant hadn't exceeded the THR. At 5 minutes and 52 seconds, the participant again exceeds the THR, continue with the assessment for the additional 15-second monitoring period. Should the participant's HR stay above the THR during the 15-second monitoring period, the test would be terminated and the time recorded at 5 min 52 sec.

Using Table 5.6 convert 52 seconds to decimal = .87

5 min + .87 = test time 5.87

Calculate the VO_2 using stepmill formula:

$$\text{VO}_2 = 57.774 + (1.757 \times (\text{TT})) - (0.904 \times \text{BMI})$$

$$\text{VO}_2 = 57.774 + (1.757 \times 5.87) - (0.904 \times 30)$$

$$\text{VO}_2 = 57.774 + 10.31 - 27.12$$

$$\text{VO}_2 = 40.96$$

$$\text{VO}_2 = 41 \text{ ml/kg/min}$$

WFI GRIP STRENGTH

Equipment

- JAMAR Hydraulic Hand dynamometer
- Towel

Figure 5.14



ASSESSMENT

The purpose of this assessment is to evaluate the maximum isometric muscular strength of the flexor muscles of the hands. There is a strong correlation between hand grip strength and upper body strength.

- Conduct Pre-Evaluation Procedures.
- Instruct the participant to towel-dry hands.
- Place the dynamometer in the participant's hand to be sized for assessment. Ensure that the hand grip is adjusted to fit snugly in the first proximal interphalangeal joint. Prior to commencing the assessment, set the dynamometer to "zero" by rotating the red peak force indicator counterclockwise.
- Advise the participant that the evaluation is a series of 6 trials, 3 for each hand, alternating hands with each attempt.
- The participant will maintain the following positions for the duration of the assessment:
 - Stand upright with spine in neutral alignment.
 - Flex elbow at a 90° angle.
 - Adduct shoulder and place hand in neutral grip position (hand shake position).
- The participant will squeeze the device with maximum force for 3 seconds while exhaling.
- The participant will slowly release grip. The needle will automatically record the highest force exerted.
- Measure both hands, alternating between right and left, completing three trials per hand.
- Reset the peak-hold needle to zero before obtaining new readings.
- Record the scores for each trail in each hand to the nearest kilogram.
- Record the highest score for each hand.

WFI ARM STRENGTH

Equipment

- Jackson Strength Evaluation System with *or* verified equivalent dynamometer
- Straight Handlebar
- Towel

Figure 5.15



ASSESSMENT

The purpose of this assessment is to evaluate the maximum isometric strength of the flexor muscles of the arm.

- Conduct Pre-Evaluation Procedures.
- Participant will towel-dry hands.
- Advise the participant that the evaluation is a series of 3 trials in which the he will "ease into" the isometric arm contraction and release slowly, without moving the arms or jerking hands.
- Place the dynamometer base plate on a level and secure surface.
- Have the participant stand upon the dynamometer base plate, with feet shoulder width apart and equal distance from the chain. The chain should travel vertically from the base to the hands.
- The participant will stand erect with knees straight and arms flexed at 90° in the sagittal plane.
- The participant will hold the bar with a wide grip and bend elbows at 90°.
- Participants must stand erect without arching back.
- Adjust the chain so that the bar can be held in the hands while the arms are flexed at 90° in the sagittal plane.
- Ensure that elbows remain adducted.
- Verify this position and ensure the chain is taut.
- The participant must not shrug shoulders, bend back, or perform any other motion other than biceps flexion in an attempt to move the handlebar in a vertical direction.
- The participant will flex maximally for 3 seconds.
- After 3 seconds, the participant will slowly relax arms, and remain at a standing rest for 30 seconds.
- Once the participant has completed the 30-second recovery period, begin the 2nd trial.
- Repeat evaluation for the 3rd trial using the same procedure.
- Record the three trials to the nearest kilogram.
- Record the highest trial.

Note: Digital readout will display both the peak force ("p") and the average force ("a") achieved during the three evaluations.

WFI LEG STRENGTH

Equipment

- Jackson Strength Evaluation System or Verified equivalent dynamometer
- V-Grip Handlebar
- Towel
- Weight lifting belt (optional)

Figure 5.16



ASSESSMENT

- The purpose of this assessment is to evaluate the maximum isometric strength of the lower body by performing a static dead lift.
 - Conduct Pre-Evaluation Procedures.
 - The participants will towel-dry hands.
 - The participant may use weight-lifting belts for support.
 - Advise the participant that the evaluation is a series of 3 trials.
 - Place the dynamometer base plate on a level and secure surface. Have the participant stand upon the dynamometer base plate, with feet spread shoulder width apart and equal distance from the lifting chain. Inform the participant to notify the assessor if he/she experiences any pain or discomfort, especially around the spine. If notified, terminate the assessment.
 - Instruct the participant to stand erect with knees straight.
 - Adjust the chain so the upper (inside) edge of the bottom cross-member of the V-grip handlebar is at the top of the participant's patella; legs are straight). Verify this position.
 - Instruct the participant to:
 - Flex at knees and hips until he/she can reach the handle.
 - Hold the bar and look straight ahead with neck in the neutral position.
 - Fully extend arms and maintain a straight (neutral) back.
 - Ensure the participant maintains the following positions:
 - The hips are directly over the feet, with trunk and knees slightly bent.
 - The shoulders are "set" or retracted to ensure that the spine is neutral (cervical, thoracic and lumbar.)
 - The elbows are extended
 - Advise the participant to "ease into" the isometric leg extension and release it slowly, without bending at the waist, flexing the arms, or jerking the hand.
 - Instruct the participant to extend legs, using proper form and technique. Encourage the participant to limit the first trial to approximately 50% of maximal effort.
 - Participant will apply — 50% force for a maximum of 3 seconds while exhaling.
 - After 3 seconds, instruct the participant to slowly relax arms and legs, and to remain at a standing rest for 30 seconds. The device will record the peak force exerted.
 - Once the participant has completed the 30-second recovery period, begin the 2nd trial.
 - The participant should use maximum effort during the 2nd and 3rd trials.
 - Record the two trials to the nearest kilogram.
 - Record the highest trial.
- Note: Digital readout will display the peak force ("p") and the average force ("a") achieved during the three evaluations.

WFI VERTICAL JUMP — Optional Assessment LEG POWER ASSESSMENT

Equipment:

- Pressure Mat - “Just Jump” Probotics
- Safety Tape - or any object that can be suspended above the mat to act as a target
- Calculator

Figure 5.17



Figure 5.18



ASSESSMENT

- The purpose of this assessment is to estimate peak power produced in the lower body.
- Collect the participant's body weight and record in kilograms ($\# \text{ lbs} \div 2.2 = \text{kg}$).
- Conduct pre-evaluation procedures.
- Place the jumping mat on a level surface. Connect the cord attached to the jumping mat to the handheld computer port.
- With the participant off the mat, turn the computer on. Choose “One Jump” on the computer menu. The display should read “Step on Mat”.
- Have the participant squat to a position where the knees are at a 90° angle and the hands by the sides (momentary pause @ 90°).
- Instruct the participant to jump straight up as high as he/she can, reaching toward the ceiling or a target object, without tucking the legs, and land with both feet on the mat.
- When the participant has completed the jump, the display will read the hang time and vertical jump in inches. The vertical jump mode resets automatically.
- Have the participant perform a series of 3 jumps and record the highest distance in inches.
- Convert the highest jump achieved in inches to centimeters ($\# \text{ inches} \times 2.54 = \text{cm}$).
- Use the power formula provided below with the jump height (cm) and body weight (kg) to estimate leg power.

Any deviations from the above techniques cannot be counted, and the participant must repeat the trial.

The following are examples of situations that require a re-evaluation:

- The participant fails to land with both feet on the mat.
- The participant tucks the legs instead of extending them while jumping. Note: Administrators can minimize the tendency of participants to tuck the legs by suspending a target object above the mat for the participant to attempt to touch.

Power formula:

$$\text{Leg Power (watts)} = [(60.7 \times \text{jump height (cm)}) + (45.3 \times \text{body weight (kg)})] - 2055$$

Use the following conversions:

Height in inches to centimeters ($\# \text{ inches} \times 2.54 = \text{cm}$)

Body weight in pounds to kilograms ($\# \text{ lbs} \div 2.2 = \text{kg}$)

WFI PRONE STATIC PLANK — CORE STABILIZATION ASSESSMENT

Equipment:

- Stopwatch
- Exercise Mat

Figure 5.19



ASSESSMENT:

The purpose of this assessment is to evaluate the muscular endurance of the core stabilizer muscles of the trunk.

- Conduct the pre-evaluation procedures.
- Instruct the participant to lay prone, keeping upper body elevated and supported by the elbows. Raise hips and legs off the floor, supporting the body on forearms and toes. Position elbows directly under the shoulders. Maintain straight body alignment from shoulder through hip, knee and ankle.
- The ankles should maintain a 90° angle, the scapulae should remain stabilized with elbows at 90°. The spine should remain in a neutral position throughout the assessment.
- Once the feet are in position, the participant then extends the knees, lifting off the floor. Start the stopwatch at this time.
- Instruct the participant to contract the abdominals so that the back will remain flat in the neutral position for the duration of the assessment.
- Any deviations from the above posture will warrant 2 verbal warnings. If a 3rd infraction occurs stop the watch and terminate the assessment.
- The assessor shall terminate the evaluation when the participant:
 - Reaches 4 minutes; or
 - Is unable to maintain proper form after the 2nd warning,
- Once the assessment termination criteria are met, stop the watch and record the time.

WFI PUSH-UP

Equipment

- Five inch prop (i.e. cup; sponge)
- Metronome
- Stopwatch

Figure 5.20



Figure 5.21



ASSESSMENT

The purpose of this assessment is to evaluate muscular endurance of the upper body.

- Conduct Pre-Evaluation Procedures.
 - Advise the participant that the evaluation is a series of push-ups performed in a 2-minute time period, for a maximum of 80 push-ups. The evaluation is initiated from the “up” position (hands are shoulder width apart, back is straight, and head is in neutral position).
- ### Advise the participant of the following:
- It is not permitted to prop feet against a wall or other stationary object.
 - Back must be straight at all times (neutral position).
 - Arms must be fully extended during the up-phase.
 - Cadence with the metronome must be maintained, (one beat up and one beat down).
 - Position the 5-inch prop on the ground beneath the participants chin.
 - The metronome is set at a speed of 80 bpm, allowing for 40 push-ups per minute, and a maximum of 80 push-ups in 2 minutes.
 - The participant must lower the body toward the floor until the chin touches the prop.

The assessor shall terminate the evaluation when the participant:

- Reaches 80 push-ups;
- Performs 3 consecutive incorrect push-ups; or
- Fails to maintain continuous motion with the metronome cadence.
- Once the assessment is complete, record the highest number of successfully completed push-ups.

* Participants with a history of shoulder and/or wrist injury that could be exacerbated by performing the conventional push-up protocol may perform the WFI alternate grip push-up evaluation.

OPTIONAL ASSESSMENT: WFI ALTERNATE GRIP PUSH-UP TEST

Equipment:

- Push-up handles
- Metronome
- Stopwatch
- Prop – 5", plus the height of the handles

Figure 5.22



Figure 5.23



- Place the modified prop so that the chin of the participant will contact the prop during the lowering phase. (Prop height = 5" plus the height of stands).
- Set the metronome at a speed of 80 bpm, allowing for 40 push-ups per minute for 2 minutes.
- The assessor shall terminate the evaluation when the participant:
 - Reaches 80 push-ups;
 - Performs three consecutive incorrect push-ups; or
 - Fails to maintain continuous motion with the metronome cadence.
- Once the assessment is complete, record the highest number of successfully completed push-ups.

ASSESSMENT:

The purpose of this assessment is to evaluate muscular endurance of the upper body. The alternate grip push-up (with stands) is an optional assessment for participants who experience muscular/skeletal discomfort in the performance of the standard WFI push-up.

- Conduct the pre-evaluation procedures.
- Advise the participant that the evaluation is a series of push-ups performed in a 2-minute time period to complete a maximum of 80 push-ups. The evaluation is initiated from the "up" position (hands are shoulder width apart, back is straight, and head is in neutral position).
- Advise the participant of the following:
 - It is not permitted to prop feet against a wall or other stationary object.
 - Back must be straight at all times (neutral position).
 - Arms must be fully extended during the up-phase.
 - Cadence with the metronome must be maintained, (one beat up and one beat down).
- Instruct the participant to grasp the push up stands, and assume the "up" position. (Caution: hex dumbbells may roll)

WFI FLEXIBILITY EVALUATION

Equipment

- Novel Acuflex I or equivalent trunk flexibility test device

Figure 5.24



Figure 5.25



- The assessor then sets the guide to 0.0 inches at the tips of the middle fingers.
- Instruct the participant to exhale continuously while stretching slowly forward, bending at the waist, and pushing the measuring device with the middle fingers. The participant will maintain full extension of the legs, and shoulders flexed, and fingers in contact with the gauge throughout the stretch. The participant will momentarily hold the stretch at the endpoint.
- The participant will perform three trials, resting for 30 seconds between trials.
- Once the assessment is complete, record the greatest reach distance from among the three trials (rounded to the nearest 1/4 inch).
- The trial must be repeated if the participant bounces, flexes knees or uses momentum to increase distance.

ASSESSMENT

The purpose of this assessment is to evaluate generalized flexibility of the shoulders, trunk, and hips.

- Conduct Pre-evaluation Procedures.
- Advise the participant that the evaluation is a series of 3 trials that evaluate the flexibility of the shoulders, trunk and hips.
- Advise the participant that the flexion required during this evaluation must be smooth and slow, as she advances the slide on the measuring device to the most distal position possible.
- Instruct the participant to sit on the floor ensuring the head, upper back, and lower back are in contact with the wall.
- The participant should then place legs together, fully extended.
- The administrator should position the sit-and-reach box flat against the feet.
- The participant should maintain head and upper/lower back in contact with the wall, scapulae retracted, while establishing arm length.
- Then, extend arms fully in front of the body with one hand over the other. (Check scapular retraction.)

FITNESS EVALUATION EQUIPMENT MANUFACTURES

Jackson Strength Evaluation System
Lafayette Instrument Company
Phone: 800-428-7545 or 765-423-1505
Website: www.licmef.com

JAMAR Hydraulic Hand Dynamometer
Lafayette Instrument Company
Phone: 800-428-7545 or 765-423-1505
Website: www.licmef.com

Novel Acuflex II Trunk Flexibility Tester
Novel Products, Inc.
Phone: 800-323-5143
E-mail: www.novelprod@aol.com

StairMaster StepMill 7000 PT
Nautilus, Inc.
Phone: 800-782-4799
Website: www.nautilus.com

Probotics “Just Jump” Mat
Probotics, Inc.
Phone: 256-489-9153
Website: www.probotics.org

APPENDIX A1

FITNESS PROTOCOLS

FITNESS PROTOCOL WORKSHEET

Name: _____ Date: _____

Last Medical Exam Date: _____ Age: _____ yrs

Weight: _____bs Weight_____kg Height_____in Height _____cm
 (1lb =.45kg) (1nch = 2.54cm)

Resting Heart Rate: _____

(If ≥ 110 bpm, provide 5-minute rest: if after rest heart rate is ≥ 110 bpm postpone evaluation)

Resting Blood Pressure: _____

(If $\geq 160/100$, provide 5-minute rest: if after rest blood pressure is $\geq 160/100$ postpone evaluation)

Target Exercise Heart Rate: _____ $(208 - 0.7 \times \text{age}) \times .85$ see Table 5.5

Body Mass Index: _____

Metric:	US:
$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$	$\text{BMI} = 703 \times \frac{\text{Weight (lb)}}{\text{Height (in)}^2}$

see Table 5.4

BODY COMPOSITION EVALUATION

Men: (See fig 5.0 – 5.2)

Measurement 1:

Tricep: _____mm Subscapular: _____mm Pectoral: _____mm

Measurement 2:

Tricep: _____mm Subscapular: _____mm Pectoral: _____mm

Measurement 3: (if required)

Tricep: _____mm Subscapular: _____mm Pectoral: _____mm

Avg. Tricep: _____mm Avg. Subscapular: _____mm Avg. Pectoral: _____mm

Sum
Skinfold: _____mm

Male
Body fat: _____%

See Table 5.1

Women: (See fig 5.6 – 5.11)

Measurement 1:

Tricep: _____mm Abdominal: _____mm Suprailliac sites: _____mm

Measurement 2:

Tricep: _____mm Abdominal: _____mm Suprailliac sites _____mm

Measurement 3: (if required)

Tricep: _____mm Abdominal: _____mm Suprailliac sites _____mm

Avg. Tricep: _____mm Avg. Abdominal: _____mm Avg. Suprailliac sites: _____mm

Sum Skinfold: _____mm

Female Body fat: _____%

See Table 5.2

WFI AEROBIC CAPACITY EVALUATION:

Submaximal Treadmill Protocol

Test Time: ____:____min:sec Test Time (decimal): _____ (see table 5.6)

Treadmill
VO₂ max. _____ml/kg/min $VO_{2max} = 56.981 + (1.242 \times TT) - (0.805 \times BMI)$

Evaluation terminated prior to exceeding target heart rate, give reason(s):

Submaximal Stepmill Protocol

Test Time: ____:____min:sec Test Time (decimal): _____ (see table 5.6)

Stepmill
VO₂ max. _____ml/kg/min $VO_{2max} = 57.774 + (1.757 \times TT) - (0.904 \times BMI)$

Evaluation terminated prior to exceeding target heart rate, give reason(s):

WFI MUSCULAR STRENGTH EVALUATION:

Grip Assessment

Trial 1, Right Hand: _____ kg Trial 1, Left Hand: _____ kg

Trial 2, Right Hand: _____ kg Trial 2, Left Hand: _____ kg

Trial 3, Right Hand: _____ kg Trial 3, Left Hand: _____ kg

Highest Score Right Hand: _____ kg Highest Score Left Hand: _____ kg

Evaluation terminated, give reason(s) _____

Leg Assessment

Trial 1: **Do not record** (Practice only) Trail 2: _____ kg Trail 3: _____ kg

Highest Leg Strength Score: _____ kg

Evaluation terminated, give reason(s) _____

Optional Assessment:

Jump Assessment (Power Evaluation)

Jump 1: _____ in. Jump 2: _____ in. Jump 3: _____ in.

Highest Jump Score _____ in. x 2.54 = _____ cm

Power Formula: $[(60.7 \times \text{jump height (cm)}) + (45.3 \times \text{body weight (kg)})] - 2055$

Leg Power = _____ watts

Evaluation terminated, give reason(s) _____

Arm Assessment

Trial 1: _____ kg Trail 2: _____ kg Trail 3: _____ kg

Highest Arm Strength Score: _____ kg

Evaluation terminated, give reason(s) _____

WFI Muscular Endurance Evaluation:

Prone Static Plank Assessment *max 4 min*

Test Time: ____:____min:sec

Evaluation terminated, give reason(s) _____

Push-up Assessment *@80bpm*

Number of successfully completed push-ups: _____

Evaluation terminated, give reason(s) _____

Optional Assessment:

Alternate Grip Push-up Assessment *@80bpm*

Number of successfully completed push-ups: _____

Evaluation terminated, give reason(s) _____

WFI Flexibility Evaluation

Sit and Reach Assessment

Trial 1: _____in

Trial 2: _____in

Trial 3: _____in

Highest Score: _____ in

Evaluation terminated, give reason(s) _____

WFI HEALTH HISTORY FORM



Last Name: _____ First Name: _____

Date: _____ Date of Birth: _____ Age: _____ Gender: Male _____ Female _____

Regular physical activity is safe for most people. However, some individuals should check with their doctor before they start an exercise program. To help us determine if you should consult with your doctor before starting to exercise with a Peer Fitness Trainer, please read the following questions carefully and answer each one honestly. All information will be kept confidential. Please check YES or NO

If you answer "Yes" to either of the following questions further medical evaluation may be needed.

YES NO

- ____ Has it been more than 12 months since your last medical exam? If NO, last exam: _____ months ago
 ____ Has your health status changed since your last medical exam?

If you answer "Yes" to two or more of the following questions further medical evaluation may be needed.

YES NO

- ____ 1. Are you a male over 45 years of age?
 ____ 2. Are you a female over 55 years of age?
 ____ 3. Has your father or other male first-degree relative (brother or son) had a heart attack, stroke or cardiovascular disease before age 55? If YES, who? _____
 ____ 4. Has your mother or other female first-degree relative (sister or daughter) had a heart attack, stroke or cardiovascular disease before age 65? If YES, who? _____
 ____ 5. Do you currently smoke tobacco products or have you quit within the previous 6 months?
 ____ 6. Is your total serum cholesterol greater than 200 mg/dl?
 ____ 7. Are you diabetic?
 ____ 8. Are you currently exercising LESS than 30 minutes most days of the week? If you answered NO, please list your activities: _____
 ____ 9. Is your waist girth greater than 40 inches (male) or 35 inches (female)?
 ____ 10. Have you ever had a systolic blood pressure ≥ 140 mmHg or diastolic ≥ 90 mmHg on at least two separate occasions or on antihypertensive medication?

If you answer "Yes" to one or more of the following questions further medical evaluation may be needed.

- ____ 1. Do you have a history of heart problems (unexplained rapid heart rate or "skipped" beats) or ever been told you have a heart murmur?
 ____ 2. Do you feel pain or discomfort in your chest at rest or with exercise?
 ____ 3. Do you ever lose consciousness or have you ever lost your balance due to dizziness?
 ____ 4. Do you ever experience unusual fatigue or shortness of breath with normal daily activities?
 ____ 5. Do you have any type of pulmonary or breathing problems such as asthma, emphysema or Chronic Obstructive Pulmonary Disease (COPD)?
 ____ 6. Have you ever had a stroke?
 ____ 7. Do you have epilepsy or have you ever had a seizure?
 ____ 8. Are you currently pregnant?
 ____ 9. Are you currently being treated for a bone or joint problem that restricts you from engaging in physical activity?
 ____ 10. Are you currently taking any dietary supplements or medications? If YES, please list the name of the medication/supplement and the reason for taking it:

Signature: _____ Date: _____

PEER FITNESS TRAINER USE ONLY:

Resting HR: _____ Resting BP: _____ / _____ Cleared to exercise Yes: _____ No: _____
 PFT Signature: _____ Date: _____ Date Physician Release Received: _____